ASME VALVE BODY MATERIAL TYPES/EQUIVALENTS & PRESSURE/TEMPERATURE RATINGS

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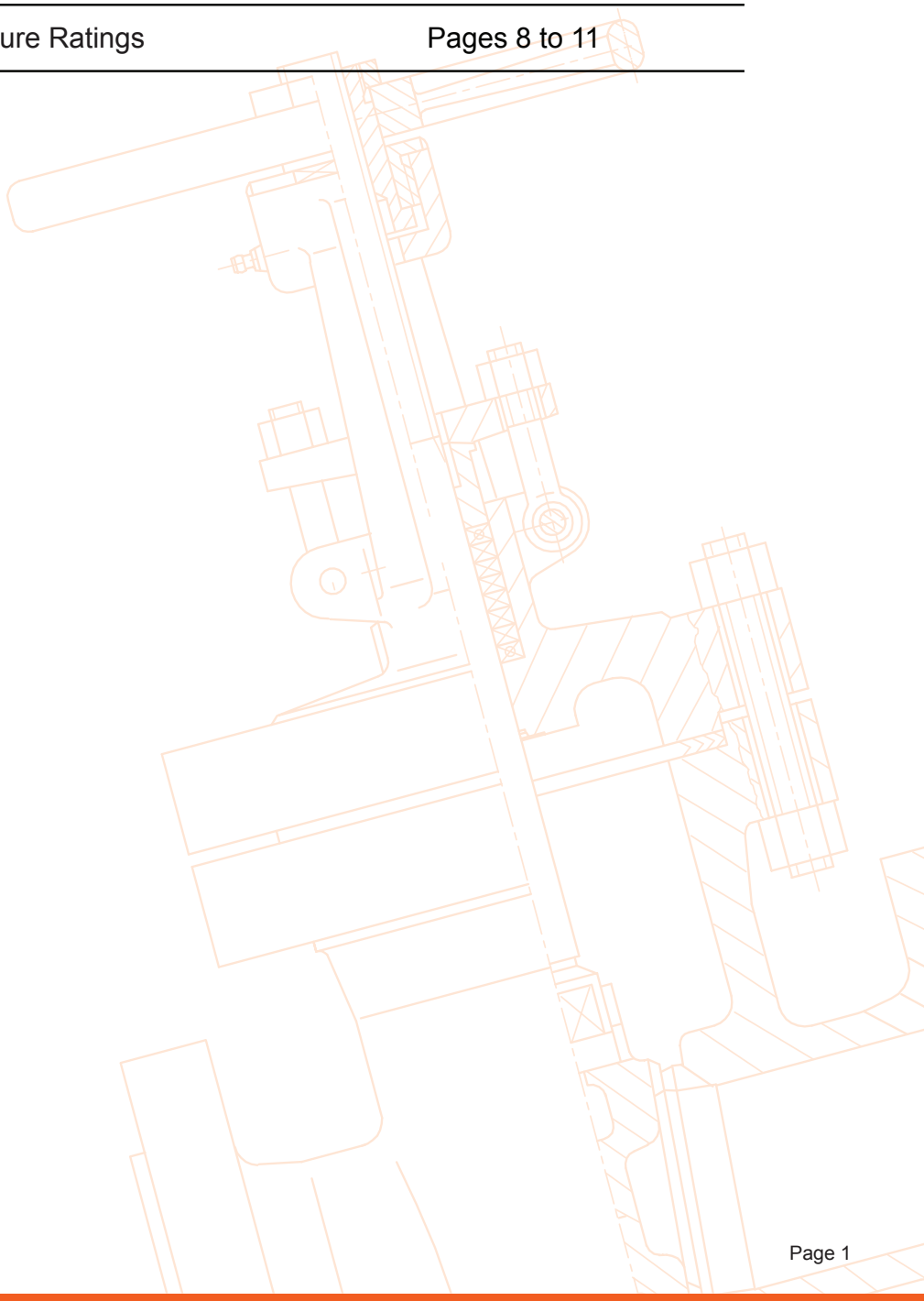

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ASTM Valve Shell Material

When material permits the usage of 1000ºF. The flanged valves are limited to 1000ºF.

ASME B16.34 Group No.	Material			Product form					
				Forgings	Castings	Plates	Bars	Tubular	
	Commercial Name	Nominal Designation	Temperature Service	Spec Grade	Spec Grade	Spec Grade	Spec Grade	Spec	Grade
1.1	Carbon Steel	C	-20ºF to 800°F				A675 70 (1)		
	Carbon Steel	C-Si	-20ºF to 800°F	A105 (2)	A216 WCB (2)	A515 70 (2)	A105 (2)	A672	B70 (2)
	Carbon Steel		-20ºF to 800°F				A696 C (2)		
	Cold Temp. Service	C-Mn-Si	-50ºF to 800°F	A350 LF2 (2)		A516 70 (2)	A350 LF2 (2)	A672	C70 (2)
	Fusion welded Steel		-20ºF to 700°F			A537 Cl. 1			
1.2	Carbon Steel	C-Si	-20ºF to 800°F					A106	C
	Carbon Steel	C-Mn-Si	-20ºF to 800°F		A216 WCC (2)				
	Cold Temp. Service		-50ºF to 650°F		A352 LCC				
	Low Temp. Service	2 1/2 Ni	-100ºF to 650°F		A352 LC2	A203 B			
	Low Temp. Service	3 1/2 Ni	-150ºF to 650°F	A350 LF3 (6)	A352 LC3	A203 E	A350 LF3		
1.3	Carbon Steel	C	-20ºF to 800°F				A675 65 (1)		
	Low Carbon Steel	C-Mn-Si	-20ºF to 800°F			A516 65		A672	C65
	Cold Temp. Service	C-Si	-50ºF to 650°F		A352 LCB	A515 65		A672	B65
	Low Temp. Service	2 1/2Ni	-100ºF to 800°F			A203 A			
	Low Temp. Service	3 1/2Ni	-150ºF to 800°F			A203 D			
1.4	Carbon Steel	C	-20ºF to 800°F				A675 60 (1)(2)(4)		
	Low Carbon Steel	C-Si	-20ºF to 800°F			A515 60 (2)(4)		A106	B (2)
			-20ºF to 800°F					A672	B 60 (2)
		C-Mn-Si	-20ºF to 800°F	A350 LF1 (2)		A516 60 (2)(4)	A350 LF1 (2)	A672	C 60 (2)
			-20ºF to 1000°F				A696 B		
1.5	High Temp. -1/2 Moly St.	C-1/2 Mo	-20ºF to 875ºF	A182 F1 (3)	A217 WC1 (3)	A204 A (3)	A182 F1 (3)	A691	CM-70 (3)
			-20ºF to 875ºF			A204 B (3)			
	Cold Temp. -1/2 Moly St.		-75ºF to 650ºF		A352 LC1				
1.6	Carbon - 1/2 Moly St.	C-1/2 Mo	-20ºF to 875°F					A335	P1 (3)
			-20ºF to 875°F					A369	FP1 (3)
	1/2 Chrome-1/2 Moly St.	1/2 Cr-1/2 Mo	-20ºF to 875°F			A387 2 Cl.1 (3b)		A691	1/2 Cr (3b)
			-20ºF to 1000°F			A387 2 Cl.2			
	1 Chrome-1/2 Moly St.	1 Cr-1/2 Mo	-20ºF to 1100°F			A387 12 Cl.1 (5)			
1.7	Carbon - 1/2 Moly St	C-1/2Mo	-20ºF to 875°F			A204 C (3)		A691	CM-75
	1/2Chrome - 1/2 Moly St.	1/2Cr-1/2Mo	-20ºF to 1000°F	A182 F2			A182 F2		
	1/2Cr- 1/2 Mo-1Ni St.	Ni-1/2Cr-1/2Mo	-20ºF to 1000°F		A217 WC4				
	3/4Cr - 1Mo-3/4Ni St.	3/4Ni-Mo-3/4Cr	-20ºF to 1050°F		A217 WC5				

(1) Leaded grades Shall not be used. For services above 850°F only killed steels with not less than 0.10% residual silicon be used.

(2) Permissible, but not recommended for prolonged use above 800°F. Max. Temp. Service of 1000°F for short periods of time.

(3) Permissible, but not recommended for prolonged use above 875°F. Max. Temp. Service of 1000°F for short periods of time.

(3b) Permissible, but not recommended for prolonged use above 875°F. Max. Temp. Service of 1200°F for short periods of time.

(4) Not to be used over 850°F

(5) Permissible, but not recommended for prolonged use above 1100°F. Max. Temp. Service of 1200°F for short periods of time.

(6) Now moved to group 1.1 refer ASME B16.34 - 2009

ASTM Valve Shell Material

When material permits the usage above 1000ºF. The flanged valves are limited to 1000ºF

ASME B16.34 Group No.	Material			Product form					
				Forgings	Castings	Plates	Bars	Tubular	
	Commercial Name	Nominal Designation	Temperature Service	Spec Grade	Spec Grade	Spec Grade	Spec Grade	Spec Grade	
1.8	1 Chrome-1/2 Moly St.	1Cr-1/2Mo	-20ºF to 1100°F			A387 12 CL.2 (4)		A691	1CR (4)
			-20ºF to 1100°F					A335	P12 (4)
			-20ºF to 1100°F					A369	FP12 (4)
	1 1/4 Chrome-1/2Moly St	1 1/4Cr-1/2Mo-Si	-20ºF to 1100°F			A387 11 Cl.1 (4)		A691	1 1/4 CR (4)
			-20ºF to 1100°F					A335	P11 (4)
			-20ºF to 1100°F					A369	FP11 (4)
	2 1/4 Chrome-1Moly St.	2 1/4Cr-1Mo	-20ºF to 1100°F			A387 22 Cl.1 (4)		A691	2 1/4 CR (4)
			-20ºF to 1100°F					A335	P22 (4)
			-20ºF to 1100°F					A335	FP22 (4)
1.9	1 Chrome-1/2Moly St.	1Cr-1/2Mo	-20ºF to 1100°F	A182 F12 Cl.2 (4)			A182 F12 Cl.2 (4)		
	1 1/4Chrome-1/2Moly St.	1 1/4Cr-1/2Mo-Si	-20ºF to 1100°F	A182 F11 Cl.2 (4)		A387 11 Cl.2 (4)	A182 F11 Cl.2 (4)		
	1 1/4Chrome-1/2Moly St.	1 1/4Cr-1/2Mo	-20ºF to 1100°F		A217 WC6		A739 B11 (4)		
1.10	2 1/4Chrome- 1Moly St.	2 1/4Cr-1Mo	-20ºF to 1100°F	A182 F22 Cl.3 (4)	A217 WC9	A387 22 Cl.2 (4)	A182 F22 Cl.3 (4)		
			-20ºF to 1100°F				A739 B22 (4)		
1.11	3Chrome- 1Moly St.	3Cr-1Mo	-20ºF to 1000°F	A182 F21 (5)		A387 21 Cl.2 (5)	A182 F21 (5)		
	Manganese-1/2Moly St.	Mn-1/2Mo	-20ºF to 875°F			A302 A & B (2)			
	Mn-Si-1/2Mo-1/2Ni St.	Mn-s1/2Mo-1/2Ni	-20ºF to 875°F			A302 C (2)			
	Mn-1/2Mo-3/4Ni St.	Mn-1/2Mo-3/4Ni	-20ºF to 875°F			A302 D (2)			
	Carbon - Manganese St.	C-Mn-Si	-20ºF to 700°F			A537 CL2			
1.12	5 Chrome -1/2 Moly St.	5Cr-1/2Mo	-20ºF to 1200ºF			A387 5 Cl.1		A691	5CR
			-20ºF to 1200ºF			A387 5 Cl.2		A335	P5
			-20ºF to 1200ºF					A369	FP5
		5Cr-1/2Mo-Si	-20ºF to 1200ºF					A335	P5b
1.13	5 Chrome -1/2Moly St.	5Cr-1/2Mo	-20ºF to 1200ºF	A182 F5a	A217 C5		A182 F5a		
			-20ºF to 1200ºF	A182 F5(6)			A182 F5		
1.14	9 Chrome -1 Moly St.	9Cr-1Mo	-20ºF to 1200ºF	A182 F9	A217 C12		A182 F9		
N/A (1)	9Cr -1Mo-V-N	9Cr-1Mo-V-N	-20ºF to 1200ºF	A182 F91	A217 C12A		A182 F91	A335	P91

(1) This material Is not yet published in ASME B16.34.34-1996 (See the Pressure - Temperature Ratings ANSI B16.34).

(2) Permissible, but not recommended for prolonged use above 875°F. Max. Temp. Service of 1010°F for short periods of time.

(4) Permissible, but not recommended for prolonged use above 1100°F. Max. Temp. Service of 1200°F for short periods of time. F12 now moved to group 1.17 as per ASME B16.34 2009

(5) Permissible, but not recommended for prolonged use above 1000°F. Max. Temp. Service of 1200°F for short periods of time.

(6) F5 now moved to 1.17 as per ASME B16.34 2009

ASTM Valve Shell Material

When material permits the usage of 1000ºF. The flanged valves are limited to 1000ºF.

ASME B16.34 Group No.	Material			Product form				
				Forgings	Castings	Plates	Bars	Tubular
	Commercial Name	Nominal Designation	Temperature Service	Spec Grade	Spec Grade	Spec Grade	Spec Grade	Spec Grade
2.1	Type 304 Standard	18Cr - 8Ni	-425ºF(6) to 1000°F(2) -425ºF(6) to 1000°F(2) -425ºF(6) to 1000°F(2) -425ºF(6) to 1000°F(2)	A182 F304	A351 CF8	A240 304	A182 F304 A479 304	A312 TP304 A358 304 A376 TP304 A430 FP304
	304 High Temp. Service	18Cr - 8Ni	20ºF to 1500ºF 20ºF to 1500ºF 20ºF to 1500ºF	A182 F304H	A351 CF10	A240 304H	A182 F304H A479 304H	A312 TP304H A376 TP304H A430 FP304H
2.2	Type 316 Standard	16Cr - 12Ni - 2Mo 18Cr - 12Ni - 2Mo	-425ºF(7) to 1000°F(2) -425ºF(7) to 1000°F(2) -425ºF(7) to 1000°F(2) -425ºF(7) to 1000°F(2)	A182 F316	 A351 CF8M	A240 316	A182 F316 A479 316	A312 TP316 A358 316 A376 TP316 A430 FP316
	316 High Temp. Service	16Cr - 12Ni - 2Mo 18Cr - 12Ni - 2Mo	-20ºF to 1500ºF -20ºF to 1500ºF -20ºF to 1500ºF -20ºF to 1500ºF	A182 F316H	 A351 CF10M	A240 316H	A182 F316H A479 316H	A312 TP316H A376 TP316H A430 FP316H
	Type 317	18Cr - 13Ni - 3Mo 19Cr - 13Ni - 3Mo	-20ºF to 1000ºF -20ºF to 1000ºF	A182 F317	 A351 CG8M	A240 317	A182 F317	A312 TP317
2.3	304L (Low carbon stainless Steel)	18Cr - 8Ni	-425ºF(6) to 800°F -425ºF(6) to 800°F	A182 F304L	A351 CF3 (3)	A240 304L	A182 F304L A479 304L	A312 TP304L
	316L (Low carbon stainless Steel)	16Cr - 12Ni - 2Mo 18Cr - 12Ni - 2Mo	-425ºF(7) to 850°F -425ºF(7) to 850°F -425ºF(7) to 850°F	A182 F316L	 A351 CF3M (4)	A240 316L	A182 F316L A479 316L	A312 TP316L
2.4	Type 321 Standard	18Cr - 10Ni - Ti	-425ºF(6) to 1000°F(2) -425ºF(6) to 1000°F(2) -425ºF(6) to 1000°F(2) -425ºF(6) to 1000°F(2)	A182 F321		A240 321	A182 F321 A479 321	A312 TP321 A358 321 A376 TP321 A430 FP321

(2) At temperatures over 1000°F, use only when the carbon content is 0.04% or higher. Max. temperature service 1500ºF

(3) This material is classified in group 2.1 in ASME B16.34-1966. The ratings are higher than 304L but the temperature limits are the same.

(4) This material is classified in group 2.1 in ASME B16.34-1966. The ratings are higher than 316L but the temperature limits are the same.

(6) For Cryogenic application

(7) For Cryogenic application. 316 & 316L shall meet requirements of low-temp in ASME B31.3, Paragraph 323.2 for LH2 Service.

ASTM Valve Shell Material

When material permits the usage above 1000ºF. The flanged valves are limited to 1000ºF

ASME B16.34 Group No.	Material			Product form									
				Forgings		Castings		Plates		Bars		Tubular	
	Commercial Name	Nominal Designation	Temperature Service	Spec	Grade	Spec	Grade	Spec	Grade	Spec	Grade	Spec	Grade
2.4	321 High Temp. Service	18Cr - 10Ni - Ti	-20ºF to 1500°F	A182	F321H			A240	321H	A182	F321H	A312	TP321H
			-20ºF to 1500°F							A479	321H	A376	TP321H
			-20ºF to 1500°F									A430	FP321H
2.5	Type 347 Standard	18Cr - 10Ni - Cb	-425ºF(6) to 1000°F(7)	A182	F347	A351	CF8C	A240	347	A182	F347	A312	TP347
			-425ºF(6) to 1000°F(7)							A479	347	A358	TP347
			-425ºF(6) to 1000°F(7)									A376	TP347
			-425ºF(6) to 1000°F(7)									A430	FP347
	347 High Temp. Service	18Cr - 10Ni - Cb	-20ºF to 1500°F	A182	F347H	A351	CF8C (1)	A240	347H	A182	F347H	A312	TP347H
			-20ºF to 1500°F							A479	347H	A37A	TP347H
			-20ºF to 1500°F									A430	FP347H
	Type 348 Standard	18Cr - 10Ni - Cb	-20ºF to 1000°F	A182	F348			A240	348	A182	F348	A376	TP348
			-20ºF to 1000°F							A479	348	A312	TP348
	348 High Temp. Service	18Cr - 10Ni - Cb	-20ºF to 1500°F	A182	F348H			A240	348H	A182	F348H	A376	TP348H
			-20ºF to 1500°F							A479	348H	A312	TP348H
2.6	309 (Heat resistant Stainless Steels)	25Cr - 12Ni	-20ºF to 1500°F			A351	CF8 (1)						
			-20ºF to 1500°F			A351	CH20 (1)						
		23Cr - 12Ni	-20ºF to 1500°F					A240	309S(1)(4)(5)			A312	TP309H
			-20ºF to 1500°F	A182	F309H			A240	309H	A182	F309H	A358	309H
2.7	310 (Heat resistant Stainless Steels)	25Cr - 20Ni	-425ºF(6) to 1500°F	A182	F310H	A351	CK20 (1)	A240	310S(1)(4)(5)	A182	F310H	A312	TP310H
			-425ºF(6) to 1500°F					A240	310H	A479	310H		
			-425ºF(6) to 1500°F							A479	310S	A358	310H
2.8	254 SMO (8) UNS S31254	20Cr - 18Ni - 6Mo	-20ºF to 750°F	A182	F44	A351	CK3M-Cun	A240	S31254	A182	F44	A312	S31254
			-20ºF to 750°F							A479	S31254	A358	S31254
	Duplex S31803	22Cr - 5Ni - 3Mo - N	-20ºF to 600°F	A182	F51	A995	4A (2)	A240	S31803	A182	F51	A789	S31803
			-20ºF to 600°F							A479	S31803	A790	S31803
	Super-Duplex S32750	25Cr - 7Ni - 4Mo - N	-20ºF to 600°F	A182	F53	A995	6A (2)	A240	S32750	A479	S32750	A789	S32750
			-20ºF to 600°F									A790	S32750
		25Cr - 7.5Ni-4Mo-N-Cu-W	-20ºF to 600°F			A351	CD3MW-Cun (2)						

(1) With Carbon content between 0.04 and 0.08.

(2) The casting grades are not published in ASME B16.34 - 1966. The references are mentioned for convenience.

(3) At temperatures over 1000°F, use only if the material is heat treated by heating to a minimum temperature of 2000°F.

(4) At temperatures over 1050°F, only when grain size is not finer then ASTM 6.

(5) For temperatures above 1000°F, use only if the material is solution heat treated at temperature specified, but not lower than 1900°F and quenched in water or rapidly cooling.

(6) For Cryogenic application

(7) At temperatures over 1000°F , use only if the carbon content is 0.04% or higher. Max temperature service 1500°F

(8) This alloy is a proprietary trademark of Avesta Sheffield.

ASTM Valve Shell Material

When material permits the usage above 1000ºF. The flanged valves are limited to 1000ºF

ASME B16.34 Group No.	Material			Product form									
				Forgings		Castings		Plates		Bars		Tubular	
	Commercial Name	Nominal Designation	Temperature Service	Spec	Grade	Spec	Grade	Spec	Grade	Spec	Grade	Spec	Grade
3.1	Alloy 20	35Ni-35Fe-20Cr-Cb	-20ºF to 800°F	B462	N08020			B463	N08020	B473	N08020	B464	N08020
			-20ºF to 800°F									B468	N08020
	Obsolete Cast Alloy 20	28Ni-19Cr-Cu-Mo	-20ºF to 300°F			A351	CN7M						
	New Cast Alloy 20 (8)	28Ni-19Cr-Cu-Mo	-20ºF to 300°F(9)			A990	CN3MCu						
3.2	Nickel	99Ni	-423ºF(5) to 600°F	B564	N02200			B162	N02200	B160	N02200	B161	N02200
			-423ºF(5) to 600°F									B163	N02200
		95Ni	-423ºF(5) to 600°F			A494	CZ100 (1)						
3.3	Nickel low C	99Ni-Low C	-423ºF(5) to 1200°F	B160	N02201			B162	N02201	B160	N02200		
3.4	Monel 400	67Ni-30Cu	-423ºF(5) to 900°F	B564	N04400	A494	M35-1(1)	B127	N04400	B164	N04400	B165	N04400
			-423ºF(5) to 900°F			A494	M30C (1)					B163	N04400
		67Ni-30Cu-S	-20ºF to 900°F	B564	N04405					B164	N04405		
3.5	Inconel 600	72Ni-15Cr-8Fe	-430ºF(5) to 1200°F	B564	N06600	A494	CY40 (1)	B168	N06600	B166	N06600	B167	N06600
			-430ºF(5) to 1200°F									B163	N06600
3.6	Incoloy 800	33Ni-42Fe-21Cr	-20ºF to 1500°F	B564	N08800			B409	N08800	B408	N08800	B163	N08800
3.7	Hastelloy B-2	65Ni-28Mo-2Fe	-425ºF(5) to 800°F	B335	N10665	A494	N7M (1)	B333	N10665	B335	N10665	B622	N10665
3.8	Hastelloy C276	54Ni-16Mo-15Cr	-425ºF(5) to 1250°F	B462	N10276			B575	N10276	B574	N10276	B622	N10276
	Chlorimet 3 (6)	56Ni-19Mo-18Cr-2Fe	-425ºF(5) to 1250°F			A494	CW-6- M(3)						
	Cast Hastelloy C-276 (7)	56Ni-16Mo-16Cr-2Fe	-425ºF(5) to 1250°F			A494 / A990	CW-2M (1)						
	Hastelloy C-22 (2)	55Ni-21Cr-13.5Mo	-430ºF(5) to 1250°F	B564	N06022			B575	N06022	B574	N06022	B622	N06022
	Hastelloy C-22	59Ni-22Cr-14Mo-4Fe-3W	-430ºF(5) to 1250°F			A494	CX2MW (4)						

1) The casting grade is not published in ASME B16.34-1966, the reference is mentioned for convenience.
(2) This material is not yet published in ASME B16.34, because is new material.
(3) The casting grade is not published in ASME B16.34 - 1966. Material considered as A494-CW6M (S Number) in ASME PVC.
(4) The casting grade is not published in ASME B16.34 - 1966. Material considered as SA494-CX2MW (P Number) in ASME PVC.
(5) For Cryogenic application
(6) This is a Trademark of Flowserve (Durco 6W6M , UNS N30107)
(7) This Alloy is considered the cast equivalent to Hastelloy C-276 and is a weldable alloy with NiCrMo-7 or NiCrMo-10 Filler Material.
(8) This alloy is specially controlled to obtain weldability properties. Can be welded with AWS A5.4 and AWS A5.9 320LR
(9) The specially controlled process of this alloy, provides castings with heat resistance near or equal to the wrought grades of alloy 20, that is to say 800ºF, but this has not been established yet by ASME B16.34

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ASME B16.34 Group No.	Material			Product form									
				Forgings		Castings		Plates		Bars		Tubular	
	Commercial Name	Nominal Designation	Temperature Service	Spec	Grade	Spec	Grade	Spec	Grade	Spec	Grade	Spec	Grade
3.8	Inconel 625	60Ni-22Cr-9Mo-3.5Cb	-430ºF(8) to 1200°F	B564	N06625	A494	CW6MC (1)	B443	N06625	B446	N06625		
	Hastelloy B	62Ni-28Mo-5Fe	-425ºF(8) to 800°F	B335	N10001	(FOR CASTING SEE GROUP 3.15)		B333	N10001	B335	N10001	B622	N10001
	Hastelloy N	70Ni-16Mo-7Cr-5Fe	-20ºF to 1300°F	B573	N10003			B434	N10003	B573	N10003		
	Hastelloy C-4	61Ni-16Mo-16Cr	-425ºF(8) to 800°F	B574	N06455	A494 or A990	CW2M (1) (9)	B575	N06455	B574	N06455	B622	N06455
	Incoloy 825	42Ni-21.5Cr-3Mo-2.3Cu	-20ºF to 1000°F	B425	N08825	A494	CU5M-Cuc (1)	B424	N08825	B425	N08825	B423	N08825
3.9	Hastelloy X	47Ni-22Cr-9Mo-18Fe	-20ºF to 1500°F	B572	N06002			B435	N06002	B572	N06002	B622	N06002
3.10	JS-700	25Ni-47Fe-21Cr-5Mo	-20ºF to 650°F	B672	N08700			B599	N08700	B672	N08700		
3.11	904L	44Fe-25Ni-21Cr-Mo	-20ºF to 700°F	B649	N08904	A351	CK3M-Cun (5)	B625	N08904	B649	N08904	B677	N08904
	AL-6XN (10)	46Fe-24Ni-21Cr-6Mo-Cu-N	-20ºF to 700°F	B564	N08367	A743, A744	CN-3MN			B691	N08367	B690	N08367
3.12	Hastelloy 20MOD	26Ni-43Fe-22Cr-5Mo	-20ºF to 800°F	B621	N08320			B620	N08320	B621	N08320	B622	N08320
	Alloy G3	47Ni-22Cr-20Fe-7Mo	-20ºF to 800°F	B581	N06985			B582	N06985	B581	N06985	B622	N06985
3.13		49Ni-25Cr-18Fe-6Mo	-20ºF to 800°F	B581	N06975			B582	N06975	B581	N06975	B622	N06975
	Alloy 31	Ni-Fe-Cr-Mo-Cu-Low C	-20ºF to 800°F	B564	N08031			B625	N08031	B649	N08031	B622	N08031
3.14	Hastelloy G	47Ni-22Cr-19Fe-6Mo	-20ºF to 1000°F	B581	N06007			B582	N06007	B581	N06007	B622	N06007
3.15	Alloy 800H	33Ni-2Fe-21Cr	-200ºF to 1500°F	B564	N08810			B409	N08810	B408	N08810	B407	N08810
	Obsolete Cast Hastelloy B (6)	Ni-Mo	-425ºF(8) to 1000°F			A494	N-12MV						
	Obsolete Cast Hastelloy C (7)	Ni-Mo-Cr	-425ºF(8) to 1000°F			A494	CW-12-MW						
3.16	Alloy 330	35Ni-19Cr-11/4Si	-20ºF to 1500°F	B511	N08330			B536	N08330	B511	N08330	B535	N08330

(1) The casting grade is not published in ASME B16.34-1966, the reference is mentioned for convenience.
(5) This material is classified in group 2.8 in ASME B16.34-1966. There is not equivalent casting grade to 904L, but many times the alloy CK3MCuN is used as a substitute of 904L alloy.
(6) This casting is now considered as obsolete for many industries. The old Hastelloy B is now substituted by Hastelloy B-2 (Group 3.7)
(7) This casting is now considered as obsolete for many industries. The old Hastelloy C is now substituted by Hastelloy C-276 (Group 3.8) (8) For Cryogenic applications
(8) For Cryogenic applications
(9) This Casting alloy similar to wrought alloy C-4, is also selected as a casting alloy similar to C-276 wrought alloy
(10) This alloy is a proprietary trademark of Allegheny Ludlum Corporation

ASME Pressure Temperature Ratings

CARBON STEEL
A216 Gr. WCB (CASTING) A105 (FORGING) A515 Gr. 70 (PLATE) A350 Gr. LF2 (FORGING)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2225	3350	5575	9275	16665	450	1125	2250	3375	5625	9375	16875
HYDROSTATIC SEAT TEST	325	825	1650	2450	4100	6800	12225	325	825	1650	2475	4125	6875	12375
-20 TO 100	285	740	1480	2220	3705	6170	11110	290	750	1500	2250	3750	6250	11250
200	260	675	1350	2025	3375	5625	10120	290	750	1500	2250	3750	6250	11250
300	230	655	1315	1970	3280	5470	9845	290	750	1500	2250	3750	6250	11250
400	200	635	1270	1900	3170	5280	9505	290	750	1500	2250	3750	6250	11250
500	170	600	1200	1795	2995	4990	8980	290	750	1500	2250	3750	6250	11250
600	140	550	1095	1640	2735	4560	8210	275	715	1425	2140	3565	5940	10690
650	125	535	1075	1610	2685	4475	8055	270	700	1400	2100	3495	5825	10485
700	110	535	1065	1600	2665	4440	7990	265	695	1390	2080	3470	5780	10405
750	95	505	1010	1510	2520	4200	7560	240	630	1260	1890	3150	5250	9450
800	80	410	825	1235	2060	3430	6170	200	515	1030	1545	2570	4285	7715
850	65	270	535	805	1340	2230	4010	130	335	670	1005	1670	2785	5015
900	50	170	345	515	860	1430	2570	85	215	430	645	1070	1785	3215
950	35	105	205	310	515	860	1545	50	130	260	385	645	1070	1930
1000	20	50	105	155	260	430	770	25	65	130	195	320	535	965

NOTE: Upon prolonged exposure to temperatures above 800 F, the carbide phase of carbon steel may be converted to graphite. Permissible, but not recommended for prolonged usage above 800 F.

LOW CARBON STEEL ASTM A352 Gr. LCB (CASTINGS) ASTM A515 Gr. 65 (PLATE)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	400	1050	2100	3150	5225	8700	15625	400	1050	2100	3150	5225	8700	15625
HYDROSTATIC SEAT TEST	300	775	1550	2300	3825	6375	11475	300	775	1550	2100	3825	6375	11475
-20 TO 100	265	695	1390	2085	3470	5785	10415	265	695	1390	2085	3470	5785	10415
200	250	655	1315	1970	3280	5470	9845	265	695	1390	2085	3470	5785	10415
300	230	640	1275	1915	3190	5315	9565	265	695	1390	2085	3470	5785	10415
400	200	620	1235	1850	3085	5145	9260	265	695	1390	2085	3470	5785	10415
500	170	585	1165	1745	2910	4850	8735	265	695	1390	2085	3470	5785	10415
600	140	535	1065	1600	2665	4440	7990	265	695	1390	2085	3470	5780	10405
650	125	525	1045	1570	2615	4355	7840	260	680	1360	2040	3400	5670	10205

NOTE: Not to be used over 650º F.

ASME Pressure Temperature Ratings

SPECIAL CARBON STEEL A216 Gr. WCC (CASTINGS)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2250	3375	5625	9375	16875	450	1125	2250	3375	5625	9275	16875
HYDROSTATIC SEAT TEST	325	825	1650	2475	4125	6875	12375	325	825	1650	2475	4125	6875	12375
-20 TO 100	290	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925	290	750	1500	2250	3750	6250	11250
400	200	705	1410	2115	3530	5880	10585	290	750	1500	2250	3750	6250	11250
500	170	665	1330	1995	3325	5540	9965	290	750	1500	2250	3750	6250	11250
600	140	605	1210	1815	3025	5040	9070	290	750	1500	2250	3750	6250	11250
650	125	590	1175	1765	2940	4905	8825	290	750	1500	2250	3750	6250	11250
700	110	570	1135	1705	2840	4730	8515	275	710	1425	2135	3560	5930	10670
750	95	505	1010	1510	2520	4200	7560	240	630	1260	1890	3150	5250	9450
800	80	410	825	1235	2060	3430	6170	195	515	1030	1545	2570	4285	7715
850	65	270	535	805	1340	2230	4010	130	335	670	1005	1670	2785	5015
900	50	170	345	515	860	1430	2750	80	215	430	645	1070	1785	3215
950	35	105	205	310	515	860	1545	50	130	260	385	645	1070	1930
1000	20	50	105	155	260	430	770	25	65	130	195	320	535	965

NOTES: Upon prolonged exposure to temperatures above 800 F, the carbide phase of carbon steel may be converted to graphite. Permissible, but not recommended for prolonged usage above 800 F.

LOW CARBON STEEL , 2 1/2 % Ni & 3 1/2% Ni STEEL FOR LOW TEMPERATURE APPLICATIONS
A 352 Gr. LCC, A352 Gr. LC2, A352 Gr. LC3 (CASTINGS) A 350 Gr. LF3 (FORGING)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2250	3375	5625	9375	16875	450	1125	2250	3375	5625	9375	16875
HYDROSTATIC SEAT TEST	325	825	1650	2475	4125	6875	12375	325	825	1650	2475	4125	6875	12375
-20 TO 100	290	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925	290	750	1500	2250	3750	6250	11250
400	200	705	1410	2115	3530	5880	10585	290	750	1500	2250	3750	6250	11250
500	170	665	1330	1995	3325	5540	9965	290	750	1500	2250	3750	6250	11250
600	140	605	1210	1815	3025	5040	9070	290	750	1500	2250	3750	6250	11250
650	125	590	1175	1765	2940	4905	8825	290	750	1500	2250	3750	6250	11250

NOTE: Not to be used over 650 F.

ASME Pressure Temperature Ratings

1/4 Cr. - 1/2 Mo STEEL A217 Gr. WC6 (2) (CASTING) A182 Gr. F11 Cl 2 (3) (FORGING)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2250	3375	5625	9375	16875	450	1125	2250	3375	5625	9375	16875
HYDROSTATIC SEAT TEST	325	825	1650	2475	4125	6875	12375	325	825	1650	2475	4125	6875	12375
-20 TO 100	290	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
300	230	720	1445	2165	3610	6015	10830	290	750	1500	2250	3750	6250	11250
400	200	695	1385	2080	3465	5775	10400	290	750	1500	2250	3750	6250	11250
500	170	695	1330	1995	3325	5540	9965	290	750	1500	2250	3750	6250	11250
600	140	605	1210	1815	3025	5040	9070	290	750	1500	2250	3750	6250	11250
650	125	590	1175	1765	2940	4905	8825	290	750	1500	2250	3750	6250	11250
700	110	570	1135	1705	2840	4730	8515	280	735	1465	2200	3665	6110	10995
750	95	530	1065	1595	2660	4430	7970	280	730	1460	2185	3645	6070	10930
800	80	510	1015	1525	2540	4230	7610	275	720	1440	2160	3600	6000	10800
850	65	485	975	1460	2435	4060	7305	260	680	1355	2030	3385	5645	101600
900	50	450	900	1350	2245	3745	6740	225	585	1175	1760	2935	4895	8805
950	35	320	640	955	1595	2655	4785	155	400	795	1195	1995	3320	5980
1000	20	215	430	650	1080	1800	3240	105	270	540	810	1350	2250	4050
1050 (1)	20	145	290	430	720	1200	2160	70	180	360	540	900	1500	2700
1100 (1)	20	95	190	290	480	800	1440	45	120	240	360	600	1000	1800
1150 (1)	20	60	125	185	310	515	925	30	75	155	230	385	45	1155
1200 (1)	15	40	75	115	190	315	565	20	45	95	140	235	395	705

(1) For weld end valves only. Flanged end ratings termInate at 1000ºF

(2) Must be used over 1100ºF

(3) Permissible, but not recommended for prologed use above 1100 °F

2 1/2 Cr.- 1Mo STEEL ASTM A217 GR. WC9 (2) ASTM A182 GR. F22 Cl. 3 (3)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2250	3375	5625	9375	16875	450	1125	2250	3375	5625	9375	16875
HYDROSTATIC SEAT TEST	325	825	1650	2475	4125	6875	12375	325	825	1650	2475	4125	6875	12375
-20 TO 100	290	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925	285	740	1485	2225	3705	6180	11120
400	200	705	1410	2115	3530	5880	10585	280	725	1450	2175	3620	6035	10865
500	170	665	1330	1995	3325	5540	9965	275	720	1440	2160	3600	6000	10800
600	140	605	1210	1815	3025	5040	9070	275	720	1440	2160	3600	6000	10800
650	125	590	1175	1765	2940	4905	8825	275	715	1430	2145	3580	5965	10735
700	110	570	1135	1705	2840	4730	8515	275	710	1425	2135	3555	5930	10670
750	95	530	1065	1595	2660	4430	7970	265	690	1380	2070	3450	5750	10350
800	80	510	1015	1525	2540	4230	7610	260	675	1345	2020	3365	5605	10095
850	65	485	975	1460	2435	4060	7305	245	645	1285	1930	3215	5355	9645
900	50	450	900	1350	2245	3745	6740	230	600	1200	1800	3000	5000	9000
950	35	375	755	1130	1885	3145	5665	180	470	945	1415	2355	3930	7070
1000	20	260	520	780	1305	2170	3910	125	325	650	975	1630	2715	4885
1050 (1)	20	175	350	525	875	1455	2625	85	220	435	655	1095	1820	3280
1100 (1)	20	110	220	330	550	915	1645	55	135	275	410	685	1145	2055
1150 (1)	20	70	135	205	345	570	1030	35	85	170	255	430	715	1285
1200 (1)	20	40	80	125	205	345	615	25	50	105	155	255	430	770

(1) For weld end valves only. Flanged end ratings terminate at 1000º F.

(2) Must not be used over 1100º F.

(3) Permissible, but not recommended for prologed use above 1100 °F

ASME Pressure Temperature Ratings

5Cr. - 1/2 Mo STEEL A217 GR. C5 (CASTING) A182 Gr. F5 (FORGING)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2250	3375	5625	9375	16875	450	1125	2250	3375	5625	9375	16875
HYDROSTATIC SEAT TEST	325	825	1650	2475	4125	6875	12375	325	825	1650	2475	4125	6875	12375
-20 TO 100	290	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
200	260	745	1490	2235	3725	6205	11170	290	750	1500	2250	3750	6250	11250
300	230	715	1430	2150	3580	5965	10740	280	730	1455	2185	3645	6070	10930
400	200	705	1410	2115	3530	5880	10585	275	720	1440	2160	3600	6000	10800
500	170	665	1330	1995	3325	5540	9965	275	720	1440	2160	3600	6000	10800
600	140	605	1210	1815	3025	5040	9070	270	705	1415	2120	3535	5895	10605
650	125	590	1175	1765	2940	4905	8825	270	700	1395	2095	3495	5820	10480
700	110	570	1135	1705	2840	4730	8515	265	685	1370	2055	3430	5715	10285
750	95	530	1055	1585	2640	4400	7920	255	660	1320	1980	3300	5500	9900
800	80	510	1015	1525	2540	4230	7610	245	640	1275	1915	3195	5320	9580
850	65	485	965	1450	2415	4030	7250	230	605	1210	1815	3020	5035	9065
900	50	370	740	1110	1850	3085	5555	175	465	925	1390	2315	3855	6945
950	35	275	550	825	1370	2285	4115	130	345	685	1030	1715	2855	5145
1000	20	200	400	595	995	1655	2985	95	250	495	745	1245	2070	3730
1050 (1)	20	145	290	430	720	1200	2160	70	180	360	540	900	1500	2700
1100 (1)	20	100	200	300	495	830	1490	50	125	250	375	620	1035	1865
1150 (1)	20	60	125	185	310	515	925	30	75	155	230	385	645	1155
1200 (1)	15	35	70	105	170	285	515	15	45	85	130	215	355	645

(1) For weld end valves only. Flanged end ratings terminate at 1000º F.

9 Cr.- 1Mo STEEL A217 GR. C12 (CASTING) A182 Gr. F9 (FORGING)

Temperature, ºF	STANDARD CLASS - ASME B16.34							SPECIAL CLASS - ASME B16.34						
	WORKING PRESSURES BY CLASSES, PSIG							WORKING PRESSURES BY CLASSES, PSIG						
	150	300	600	900	1500	2500	4500	150	300	600	900	1500	2500	4500
HYDROSTATIC SHELL TEST	450	1125	2250	3375	5625	9375	16875	450	1125	2250	3375	5625	9375	16875
HYDROSTATIC SEAT TEST	325	825	1650	2475	4125	6875	12375	325	825	1650	2475	4125	6875	12375
-20 TO 1000	290	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250	290	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925	290	750	1500	2250	3750	6250	11250
400	200	705	1410	2115	3530	5880	10585	290	750	1500	2250	3750	6250	11250
500	170	665	1330	1995	3325	5540	9965	290	750	1500	2250	3750	6250	11250
600	140	605	1210	1815	3025	5040	9070	290	750	1500	2250	3750	6250	11250
650	125	590	1175	1765	2940	4905	8825	290	750	1500	2250	3750	6250	11250
700	110	570	1135	1705	2840	4730	8515	280	735	1465	2200	3655	6110	10995
750	95	530	1065	1595	2660	4430	7970	280	730	1460	2185	3645	6070	10930
800	80	510	1015	1525	2540	4230	7610	275	720	1440	2160	3600	6000	10800
850	65	485	975	1460	2435	4060	7305	260	680	1355	2030	3385	5645	10160
900	50	450	900	1350	2245	3745	6740	230	600	1200	1800	3000	5000	9000
950	35	375	755	1130	1885	3145	5655	180	470	945	1415	2355	3930	7070
1000	20	255	505	760	1270	2115	3805	120	315	635	950	1585	2645	4755
1050 (1)	20	170	345	515	855	1430	2570	80	215	430	645	1070	1785	3215
1100 (1)	20	115	225	340	565	945	1695	55	140	285	425	710	1180	2120
1150 (1)	20	75	150	225	375	630	1130	35	95	190	285	470	785	1415
1200 (1)	20	50	105	155	255	430	770	25	65	130	195	320	535	965

(1) For weld end valves only. Flanged end ratings terminate at 1000º F.