ASTM A234 WP22 material data

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ASTM/ASME A234/SA234 Alloy Steel A234 WP22 Buttweld Fittings Manufacturer | Alloy Steel WP22 Buttweld Fittings | WP22 Buttweld Fittings | ASTM/ASME A234 Buttweld Fittings | ASME B16.9 Alloy Steel Butt Weld Pipe Fittings

The Cr-Mo alloy steel pipe fittings manufactured to ASTM A234 includes the grades of WP1, WP12 CL1, WP12 CL2, WP11 CL1, WP11 CL2, WP11 CL3, WP22 CL1, WP22 CL3, WP24, WP5 CL1, WP5 CL3, WP9 CL1, WP9 CL3, WP91, WP911, WP92. They can be widely used in moderate or high-temperature service. The most common product form of ASTM A234 is butt welding pipe fittings manufactured to ASME B16.9. The BW pipe fittings can be made from either seamless pipes, or fusion-welded pipes which shall be with filler metal added and shall conform to the chemical requirements of the standard specification.

https://alloypipefitting.com/product-category/butt-weld/a234-wp22-fitting

1. Chemical Composition Requirements

Chemical Composition of ASTM A234 Alloy Steel Pipe Fittings(%)

Grade	C	Mn	P	S	Si	Cr	Mo	Others
WP1	0.28	0.30-0.90	0.045	0.045	0.10-0.50	-	0.44-0.65	-
WP12 CL1, WP12 CL2	0.05-0.20	0.30-0.80	0.045	0.045	0.60	0.80-1.25	0.44-0.65	-
WP11 CL1	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	1.00-1.50	0.44-0.65	-
WP11 CL2, WP11 CL3	0.05-0.20	0.30-0.80	0.040	0.040	0.50-1.00	1.00-1.50	0.44-0.65	-
WP22 CL1, WP22 CL3	0.05-0.15	0.30-0.60	0.040	0.040	0.50	1.90-2.60	0.87-1.13	-
WP24	0.05-0.10	0.30-0.70	0.020	0.010	0.15-0.45	2.20-2.60	0.90-1.10	*A
WP5 CL1, WP5 CL3	0.15	0.30-0.60	0.040	0.030	0.50	4.0-6.0	0.44-0.65	-
WP9 CL1, WP9 CL3	0.15	0.30-0.60	0.030	0.030	1.00	8.0-10.0	0.90-1.10	-
WPR	0.20	0.40-1.06	0.045	0.050	-	-	-	*B
WP91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	0.85-1.05	0.85-1.05	*C
WP911	0.09-0.13	0.30-0.60	0.020	0.010	0.10-0.50	0.90-1.10	0.90-1.10	*D
WP92	0.07-0.13	0.30-0.60	0.020	0.010	0.50	0.30-0.60	0.30-0.60	*E

*All values listed are maximum unless a range is provided or otherwise specified.

*A – Cu:0.75-1.25,Al:≤0.020,B:0.0015-0.0070,N:≤0.12,Ti:0.06-0.10,V:0.20-0.30. *B – Ni:1.60-2.24,Cu:0.75-1.25.

*C – Ni:≤0.40,V:0.18-0.25,Co:0.06-0.10,N:0.03-0.07,Al:≤0.02,Ti:≤0.01,Zr:≤0.01.

*D – Ni:≤0.40,V:0.18-0.25,Co:0.06-0.10,N:0.04-0.09,Al:≤0.02,B:0.003-0.006,W:0.90-1.10,Ti:≤0.01,Zr:≤0.01.

*E – Ni:≤0.40,Al:≤0.02,B:0.001-0.006,Co:0.04-0.09,N:0.03-0.07,Ti:≤0.01,W:1.50-2.00,V:0.15-0.25,Zr:≤0.01.

*The unit “%” shall be applied to the chemical composition values from *A to *E.

2. Mechanical Properties

Mechanical Properties of ASTM A234 Alloy Steel Pipe Fittings

Grade	Tensile Strength, min. ksi[MPa]	Yield Strength, min. ksi[MPa]	Elongation, min. %	
			Longitudinal	Transverse
WP1	55-80[380-550]	30[205]	20	13
WP12 CL1	60[415]	32[220]	22	14
WP12 CL2	70[485]	40[275]	22	14
WP11 CL1	60[415]	30[205]	22	14
WP11 CL2	70[485]	40[275]	22	14
WP11 CL3	75[520]	45[310]	22	14
WP22 CL1	60[415]	30[205]	22	14
WP22 CL3	75[520]	45[310]	22	14
WP24	85[585]	60[415]	20	-
WP5 CL1	60[415]	30[205]	22	14
WP5 CL3	75[520]	45[310]	22	14
WP9 CL1	60[415]	30[205]	22	14
WP9 CL3	75[520]	45[310]	22	14
WPR	63-99[435-605]	46[315]	20	-
WP91	90[620]	60[415]	20	13
WP911	90-120[620-840]	64[440]	20	13
WP92	90-120[620-840]	64[440]	20	13

3. Heat Treatment

Pipe fittings of ASTM A234 alloy steel, after forming at an elevated temperature, shall be cooled to a temperature. below the critical range under suitable conditions to prevent injurious defects caused by too rapid cooling, but in no case more rapidly than the cooling rate in still air.

- Fittings of Grades WP1, WP11 Class 1, WP11 Class 2, WP11 Class 3, WP12 Class 1, WP12 Class 2, WP22 Class 1, WP22 Class 3, WP5, and WP9 shall be furnished in the full-annealed, isothermal-annealed, or normalized and tempered condition. If normalized and tempered, the tempering temperature for WP11 Class 1, WP11 Class 2, WP11 Class 3, WP12 Class 1, and WP12 Class 2 shall not be less than 1150 ° F [620 ° C]; for Grades WP5, WP9, WP22 Class 1, and WP22 Class 3 the tempering temperature shall not be less than 1250 ° F [675 ° C].
- Fittings of Grades WP1, WP12 Class 1, or WP12 Class 2 either hot formed or cold formed may be given a final heat treatment at 1200 ° F [650 ° C].
- Fittings of WP24 either hot formed or cold formed shall be furnished in the normalized and tempered condition. The normalizing temperature range shall be 1800 to 1975 ° F [980 to 1080 ° C]. The tempering temperature range shall be 1350 to 1470 ° F [730 to 800 ° C].
- Fittings in all thicknesses produced by fusion welding after the heat treatment specified in 1 shall be post-weld heat treated at a temperature not less than prescribed above for tempering except that Grade WP1 is required to be post-weld heat treated only when the nominal wall thickness at the welded joint is 1⁄2 in. [13 mm] or greater, and except that preheat and post weld heat treatment are not required for WP24 fittings whose section thickness does not exceed 0.500 in. [12.7 mm].
- Grade WP91 shall be normalized at 1900 ° F [1040 ° C] minimum, and 1975 ° F [1080 ° C] maximum, and tempered in the temperature range of 1350 ° F [730 ° C] to 1470 ° F [800 ° C] as a final heat treatment.
- Grade WP911 shall be normalized in the temperature range of 1900 to 1975 ° F [1040 to 1080 ° C], and tempered in the temperature range of 1365 to 1435 ° F [740 to 780 ° C] as a final heat treatment.
- Grade WP92 shall be normalized at 1900 ° F [1040 ° C] minimum, and 1975 ° F [1080 ° C] maximum, and tempered in the temperature range of 1350 ° F [730 ° C] to 1470 ° F [800 ° C] as a final heat treatment.

4. Inspection and Test

ASTM A234 Cr-Mo alloy steel grade P91: 90° Elbow L/R 16″ x72mm.

Except for dimensional inspection and visual examination, the inspection & tests that shall be selectively performed on ASTM A234 alloy steel pipe fittings include: hydrostatic test, liquid penetration test, magnetic

particle examination, ultrasonic test, nondestructive electromagnetic(eddy current) test.

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