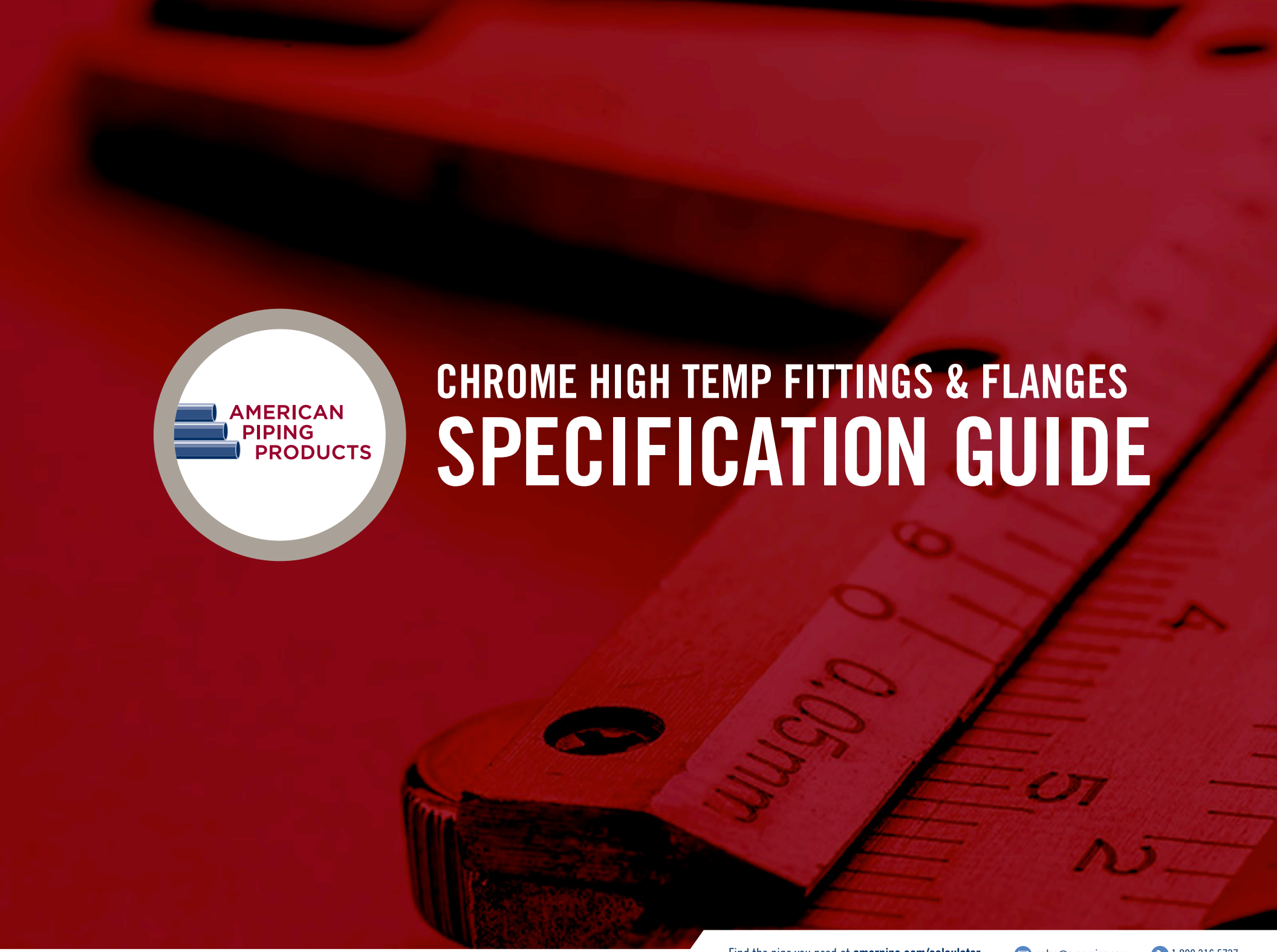

AMERICAN PIPING PRODUCTS

CHROME HIGH TEMP FITTINGS & FLANGES
SPECIFICATION GUIDE

CHROME HIGH TEMP FITTINGS & FLANGES

Specification and Grade	A/SA234-WP5 CL1		A/SA234-WP9 CL1		A/SA234-WP11 CL1		A/SA234-WP22 CL1		A/SA234-WP91		A/SA182-F5 CL1		A/SA182-F9 CL1		A/SA182-F11 CL1		A/SA182-F22 CL1		A/SA182-F91	
Addendum	2013		2013		2013		2013		2013		2013		2013		2013		2013		2013	
Products Allowed	Forged or Rolled High Temp Service		Forged or Rolled High Temp Service		Welded pipe fittings		Welded pipe fittings		Welded pipe fittings		Forged or Rolled High Temp Service		Forged or Rolled High Temp Service		Forged or Rolled High Temp Service		Forged or Rolled High Temp Service		Forged or Rolled High Temp Service	

Ladle/Product Analysis

Chemistry	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Carbon (C)		0.150		0.150	0.050	0.150	0.05	0.15	0.080	0.120		0.150		0.150	0.050	0.150	0.050	0.150	0.080	0.120
Manganese (MN)	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600	0.300	0.600
Phosphorus (P)		0.030		0.030		0.030		0.040		0.020		0.030		0.030		0.030		0.040		0.020
Sulfur (S)		0.030		0.030		0.040		0.040		0.010		0.030		0.030		0.030		0.040		0.010
Silicon (SI)		0.500	0.500	1.000	0.500	1.000		0.050	0.200	0.500		0.500	0.500	1.000	0.500	1.000		0.050	0.200	0.500
Copper (CU)																				
Nickel (NI)		0.500								34.000		0.500								0.400
Chrome (CR)	4.000	6.000	8.000	10.000	1.000	1.500	1.900	2.600	8.000	9.500	4.000	6.000	8.000	10.000	1.000	1.500	2.000	2.500	8.000	9.500
Molybdenum (MO)	0.440	0.650	0.900	1.100	0.440	0.650	0.870	1.130	0.850	1.050	0.440	0.650	0.900	1.100	0.440	0.650	0.870	1.130	0.850	1.050
Vanadium (V)									0.180	0.250									0.180	0.250
Columbium (CB)									0.060	0.100									0.060	0.100
Titanium (Ti)										0.010										0.010
Boron (B)																				
Aluminum (AL)										0.020										0.020
Calcium (CA)																				
Nitrogen (N)									0.03	0.07									0.03	0.07
Tin (Sn)										0.01										
Zirconium(Zi)																				0.01
Cu+ Cr+Ni+Mo+V																				
Cu+ Cr+Ni+Mo																				
CB+V+TI																				
CB+V																				
V+Ti																				
Cr+Mo																				
Notes *	* Unless specified fittings made from plate can be Cource or Fine grain				* Unless specified fittings made from plate can be Cource or Fine grain		* Unless specified fittings made from plate can be Cource or Fine grain		* Unless specified fittings made from plate can be Cource or Fine grain											
Melt, BOP,OH, VDG, EF,VARM	All		All		All		All		All		All		All		All		All		All	
Fully Killed, Fine Grain	Yes *		Yes		Yes *		Yes *		Yes *											

CHROME HIGH TEMP FITTINGS & FLANGES

SPECIAL TOLERANCES

Specification and Grade	A/SA234-WP5 CL1		A/SA234-WP9 CL1		A/SA234-WP11 CL1		A/SA234-WP22 CL1		A/SA234-WP91		A/SA182-F5 CL1		A/SA182-F9 CL1		A/SA182-F11 CL1		A/SA182-F22 CL1		A/SA182-F91	
Addendum	2013		2013		2013		2013		2013		2013		2013		2013		2013		2013	
Carbon Equivalent (CE)																				
	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.	MIN	AVG.
CHARPY 10x10 mm																				
Temperature °F (°C)																				
FT/#'S-Long																				
FT/#'S-Trn																				
LAT/EXP (min.MLS)																				
Sheer %																				
CHARPY 10x10 mm																				
Temperature °F (°C)																				
FT/#'S-Long																				
FT/#'S-Trn																				
LAT/EXP (min.MLS)																				
Sheer %																				
Hydro Test																				
NDE																				
No repair by welding																				
No mercury contami-nation																				
Flattening Test																				
Heat Treat Options																				
As Rolled																				
Normalizing																				
Normalized and Tempered	N1750°F/T1250°F (air cool)		N1750°F/T1250°F (air cool)		N1650°F/T1150°F (air cool)		N1650°F/T1250°F (air cool)		N1900°F-1975°F/ T1365°F-1435°F (air cool)		N1750°F/ T1250°F (air cool)		N1750°F/ T1250°F (air cool)		N1650°F/T1150°F (air cool)		N1650°F/T1150°F (air cool)		N1900°F-1975°F/ T1350°F-1470°F (air cool)	
Isothermal-annealed																				
Full-annealed											1750°F	Furn. Cool	1750°F	Furn. Cool	1650°F	Furn. Cool	1650°F	Furn. Cool		
Quenched & Tempering																				
Tempering Temp restriction	1250°F		1250°F		1150°F		1250°F													

* **Carbon Equivalent:** CE = C = Mn/6 + (Cr + Mo = V)/5 + (Ni + Cu)/15

Cabon under .12: CEPcm = C + (Si/30) + (Mn/20) + (Cu/20) + (Ni/60) + (Cr/20) + (Mo/15) + (V/10) + 5B

CHROME HIGH TEMP FITTINGS & FLANGES

MECHANICAL

Specification and Grade	A/SA234-WP5 CL1		A/SA234-WP9 CL1		A/SA234-WP11 CL1		A/SA234-WP22 CL1		A/SA234-WP91		A/SA182-F5 CL1		A/SA182-F9 CL1		A/SA182-F11 CL1		A/SA182-F22 CL1		A/SA182-F91	
Addendum	2013		2013		2013		2013		2013		2013		2013		2013		2013		2013	
Product Test	Buyer option		Buyer option		Buyer option		Buyer option		Buyer option		Buyer option		Buyer option		Buyer option		Buyer option		Buyer option	
Nunber of samples																				
TENSILE psi	70,000		85,000		60,000		75,000		90,000		70,000		85,000		60,000		60,000		90,000	
YIELD psi	40,000		55,000		30,000		45,000		64,000		40,000		55,000		30,000		30,000		60,000	
Y/T Ratio																				
ELOG. (2"std. round) Long.	20%		20%		22%		22%		20%		20%		20%		20%		20%		20%	
ELOG. (2"std. round) Trans.					14%		14%		13%											
ELOG. (2"std. Strip 5/16">) Long.					30%		30%													
ELOG. (2"std. Strip 5/16">) Trans.					20%		20%													
Reduction of Area	35%		40%								35%		40%		45%		35%		40%	
Hardness(BHN)		217		217		197		197	190	250	143	217	179	217	121	174		170	190	248
Hardness # of test	2		2		2		2		2											

MTR INFORMATION

Specification, Grade, Addendum	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Type heat treatment	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Chemical analysis results	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Additional Product analysis results	Yes		Yes		Yes		Yes		Yes		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option	
Tensile property results	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Impact test results	Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option		Purchaser Option	
Hardness results	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Any supplementary testing required by the purchase order	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	