API 600 TRIM NUMBER CHART & SERVICE COVERAGE

STANDARD TRIM CONFIGURATIONS

AUSTRALIAN PIPELINE VALVE®

The following table details standard trim materials available for API600 bolted bonnet Gate valves†. Including API600 Nominal Seating Surface, Stem and Backseat Bushing or Weld-deposit Materials and Hardness.

API Trim Number	Nominal Trim	Trim code	Stem & other trim parts	Disc/Wedge Surface Ⓙ	Seat surface Ⓙ	Seating Surface Hardness (HB) Minimum Ⓐ	Seat Surface Material Type Ⓑ	Seat Surface Typical Specification Guide			Stem/Bushing				Trim Material Grade
								Cast	Forged	Welded Ⓜ	Material Type Ⓑ	Typical Specifications Type	Stem Hardness (HB)	Backseat Bushing Hardness (HB)	
1	410 ①	F6	410 (13Cr) (200-275 HBN)	F6 (13Cr) (200 HBN)	410 (13Cr)	250	13Cr	ASTM A217 (CA 15)	ASTM A182 (F6a)		13Cr	ASTM A276-T410 or T420	200 min 275 max	250 min	13Cr-0.75Ni-1Mn
2	304 ①	304	304	304 (18Cr-8Ni)	304 (18Cr-8Ni)	Note Ⓓ	18Cr-8Ni	N/A	ASTM A182 (F304)	AWS A5.9 ER304	18Cr-8Ni	ASTM A276-T304	Note Ⓓ	Note Ⓓ	19Cr-9.5Ni-2Mn-0.08C
2S	304 - Hard faced	304HFS	304	304 (18Cr-8Ni)	304 (18Cr-8Ni)+St Gr6	350	Co-Cr A Ⓖ	N/A	ASTM A182 (F304)	AWS A5.9 ER304	18Cr-8Ni	ASTM A276-T304	Note Ⓓ	Note Ⓓ	19Cr-9.5Ni-2Mn-0.08C
3	310	310	310 (25Cr-20Ni)	310 (25Cr-20Ni)	310 (25Cr-20Ni) Note Ⓓ	Note Ⓓ	25Cr-20Ni	N/A	ASTM A182 (F310)	AWS A5.9 ER310	25Cr-20Ni	ASTM A276-T310	Note Ⓓ	Note Ⓓ	25Cr-20.5Ni-2Mn
4	410 - Hard (Hard F6)	F6H	410 (13Cr) (200-275 HBN)	F6 (13Cr) (200-275 HBN)	F6 (13Cr)	750 Ⓔ	Hard 13Cr	N/A	Note Ⓕ	N/A	13Cr	ASTM A276-T410 or T420	200 min 275 max	250 min	13Cr-0.75Ni-1Mn
5	410 - Full Hard faced	F6HF	410 (13Cr) (200-275 HBN)	St Gr6 (CoCr Alloy)	St Gr6 (CoCr Alloy)	350 Ⓔ	Co-Cr A Ⓖ	N/A	N/A	AWS A5.13 ECoCr-A or AWS A5.21 ERCoCr-A	13Cr	ASTM A276 T410 or T420	200 min 275 max	250 min	13Cr-0.5Ni-1Mn/Co-Cr-A
5a	410 - Full Hard faced	F6HF	410 (13Cr) (200-275 HBN)	Hardf. NiCr Alloy	Hardf. NiCr Alloy	350 Ⓔ	Ni-Cr	N/A	N/A	Note Ⓗ	13Cr	ASTM A276 T410 or T420	200 min 275 max	250 min	13Cr-0.5Ni-1Mn/Co-Cr-A
6	410 (F6) and Cu-Ni	F6HFS	410 (13Cr) (200-275 HBN)	Monel 400® (NiCu Alloy)	CA15 or CuNi	250 Ⓙ	13Cr	ASTM A217 (CA 15)	ASTM A182 (F6a)	AWS A5.9 ER410	13Cr	ASTM A276 T410 or T420	200 min 275 max	250 min	13Cr-0.5Ni-1Mn/Ni-Cu
						175 Ⓙ	Cu-Ni	N/A	Note Ⓚ	N/A					
7	410 (F6) Hard F6	F6HF+	410 (13Cr) (200-275 HBN)	F6 (13Cr)	F6 (Hard 13Cr) or 13Cr	250 Ⓙ	13Cr	ASTM A217 (CA 15)	AWS A5.9 ER410	AWS A5.9 ER410	13Cr	ASTM A276 T410 or T420	200 min 275 max	250 min	13Cr-0.5Ni-1Mo/13Cr-0.5Ni-Mo
						750 Ⓙ	Hard 13Cr	N/A	Note Ⓕ	N/A					
8	F6 (410) - Hard faced	F6HFS	410 (13Cr) (200-275 HBN)	410 (13Cr)	St Gr6 (CoCr Alloy)	250 Ⓙ	13Cr	ASTM A217 (CA 15)	ASTM A182 (F6a)	AWS A5.9 ER410	13Cr	ASTM A276 T410 or T420	200 min 275 max	250 min	13Cr-0.75Ni-1Mn/1/2Co-Cr-A
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	AWS A5.13 ECo-Cr-A or AWS A5.21 ERCoCr-A					
8a	F6 (410) - Hard faced	F6HFS	410 (13Cr) (200-275 HBN)	F6 (13Cr)	Hardf. NiCr Alloy	250 Ⓙ	13Cr	ASTM A217 (CA 15)	ASTM A182 (F6a)	AWS A5.9 ER410	13Cr	ASTM A276 T410 or T420	200 min 275 max	250 min	13Cr-0.75Ni-1Mn/1/2Co-Cr-A
						350 Ⓙ	Ni-Cr	N/A	N/A	Note Ⓗ					
9	Monel	Monel	Monel® (NiCu Alloy)	Monel 400® (NiCu Alloy)	Monel 400® (NiCu Alloy)	Note Ⓓ	Ni-Cu Alloy	N/A	MFG Standard	N/A	Ni-Cu Alloy	MFG Standard	Note Ⓓ	Note Ⓓ	70Ni-30Cu
10	316	316	316 (18Cr-Ni-Mo)	316 (18Cr-Ni-Mo)	316 (18Cr-Ni-Mo)	Note Ⓓ	18Cr-8Ni	ASTM A351 (CF8M)	ASTM A182 (F316)	AWS A5.9 ER316	18Cr-8Ni-Mo	ASTM A276-T316	Note Ⓓ	Note Ⓓ	18Cr-12Ni-2.5Mo-2Mn
11	Monel - Hard faced	MonelHFS	Monel® (NiCu Alloy)	Monel 400® (NiCu Alloy)	Monel 400®+St Gr6	Note Ⓓ	Ni-Cu Alloy	N/A	MFG Standard	N/A	Ni-Cu Alloy	MFG Standard	Note Ⓓ	Note Ⓓ	70Ni-30Cu/1/2Co-Cr-A
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	See Trim 5 or 5A					
12	316 - Hard faced	316HFS	316 (Cr-Ni-Mo)	316 (18Cr-8Ni-Mo)	316+St Gr6	Note Ⓓ	18Cr-*Ni-Mo	ASTM A351 (CF8M)	ASTM A182 (F316)	AWS A5.9 ER316	18Cr-8Ni-Mo	ASTM A276-T316	Note Ⓓ	Note Ⓓ	18Cr-12Ni-2.5Mo-2Mn1/2Co-Cr-A
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	See Trim 5 or 5A					
13	Alloy 20	Alloy 20	Alloy 20 (19Cr-29Ni)	Alloy 20 (19Cr-29Ni)	Alloy 20 (19Cr-29Ni)	Note Ⓓ	19Cr-29Ni	ASTM A351 (CN7M)	ASTM B473	AWS A5.9 ERA20	19Cr-29Ni	ASTM B473	Note Ⓓ	Note Ⓓ	29Ni-19Cr-2.5Mo-0.07C
14	Alloy 20 - Hard faced	Alloy 20HFS	Alloy 20 (19Cr-29Ni)	Alloy 20 (19Cr-29Ni)	Alloy 20 St Gr6	Note Ⓓ	19Cr-29Ni	ASTM A351 (CN7M)	ASTM B473	AWS A5.9 ERA20	19Cr-29Ni	ASTM B473	Note Ⓓ	Note Ⓓ	29Ni-19Cr-2.5Mo-0.07C/1/2Co-Cr-A
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	See Trim 5 or 5A					
15	304 - Full Hard faced	304HF	304 HF (18Cr-8Ni-Mo)	304+St Gr6	304+St Gr6	350 Ⓔ	Co-Cr A Ⓖ	N/A	N/A	AWS A5.13 ECoCr-A or AWS A5.21 ERCoCr-A	18Cr-8Ni	ASTM A276-T304	Note Ⓓ	Note Ⓝ	19Cr-9.5Ni-2Mn-0.08C/1/2Co-Cr-A
16	316 - Full Hard faced	316HF	316 HF (18Cr-8Ni-Mo)	316+St Gr6	316+St Gr6	350 Ⓔ	Co-Cr A Ⓖ	N/A	N/A	AWS A5.13 ECoCr-A or AWS A5.21 ERCoCr-A	18Cr-8-Ni-Mo	ASTM A276-T316	Note Ⓓ	Note Ⓝ	18Cr-12Ni-2.5Mo-2Mn/Co-Cr-Mo
17	347 - Full Hard faced	347HF	347 HF (18Cr-10Ni-Cb)	347+St Gr6	347+St Gr6	350 Ⓔ	Co-Cr A Ⓖ	N/A	N/A	AWS A5.13 ECoCr-A or AWS A5.21 ERCoCr-A	18Cr-10Ni-Cb	ASTM A276-T347	Note Ⓓ	Note Ⓝ	18Cr-10Ni-Cb/Co-Cr-A
18	Alloy 20 - Full Hard faced	Alloy 20 HF	Alloy 20 (19Cr-29Ni)	Alloy 20+St Gr6	Alloy 20+St Gr6	350 Ⓔ	Co-Cr A Ⓖ	N/A	N/A	AWS A5.13 ECoCr-A or AWS A5.21 ERCoCr-A	19Cr-29Ni	ASTM B473	Note Ⓓ	Note Ⓝ	19 Cr-29Ni/Co-Cr-A
19	Nickel①					Note Ⓓ	Ni Alloy	MFG Standard ①	MFG Standard ①	MFG Standard	Ni Alloy ①	MFG Standard ①	Note Ⓓ	Note Ⓝ	
19a	Alloy 625					Note Ⓓ	Alloy 625	ASTM A494 (CW6MC)	ASTM B564 UNS N06625	AWS A5.14 ERNiCrMo-3	Alloy 625	ASTM B564 UNS N06625	Note Ⓓ	Note Ⓝ	
19b	Alloy C276					Note Ⓓ	Alloy C276	ASTM A494 (CW2M)	ASTM B564 UNS N10276	AWS A5.14 ERNiCrMo-4	Alloy C276	ASTM B564 UNS N10276	Note Ⓓ	Note Ⓝ	
19c	Alloy 825					Note Ⓓ	Alloy 825	ASTM A494 (CU5MCuC)	ASTM B564 UNS N08825	AWS A5.14 ERNiCrMo-3	Alloy 825	ASTM B564 UNS N08825	Note Ⓓ	Note Ⓝ	
20	Nickel① and Hard faced					Note Ⓓ	Ni Alloy	MFG Standard ①	MFG Standard ①	AWS 5.13 ECoCr-A or AWS 5.21 ECoCr-A	Ni Alloy ①	MFG Standard ①	Note Ⓓ	Note Ⓝ	
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A						
20a	Alloy 625 and Hard faced					Note Ⓓ	Alloy 625	ASTM A494 (CW6MC)	ASTM B564 UNS N06625	AWS A5.14 ERNiCrMo-3	Alloy 625	ASTM B564 UNS N06625	Note Ⓓ	Note Ⓝ	
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	AWS 5.13 ECoCr-A or AWS 5.21 ECoCr-A					
20b	Alloy C276 and Hard faced					Note Ⓓ	Alloy C276	ASTM A494 (CW2M)	ASTM B564 UNS N10276	AWS A5.14 ERNiCrMo-4	Alloy C276	ASTM B564 UNS N10276	Note Ⓓ	Note Ⓝ	
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	AWS 5.13 ECoCr-A or AWS 5.21 ECoCr-A					
20c	Alloy 825 and Hard faced					Note Ⓓ	Alloy 825	ASTM A494 (CU5MCuC)	ASTM B564 UNS N08825	AWS A5.14 ERNiCrMo-3	Alloy 825	ASTM B564 UNS N08825	Note Ⓓ	Note Ⓝ	
						350 Ⓙ	Co-Cr A Ⓖ	N/A	N/A	AWS 5.13 ECoCr-A or AWS 5.21 ECoCr-A					
21	CoCr-A (or CRA) Hard faced Ⓩ					350 Ⓔ	Co-Cr A Ⓖ	N/A	N/A	AWS 5.13 ECoCr-A or AWS 5.21 ECoCr-A	Ni Alloy ①	MFG Standard ①	Note Ⓓ	Note Ⓝ	
Special	Bronze	Bronze	410 (CR13)	Bronze	Bronze										
Special	Alloy 625	Alloy 625	Alloy 625	Alloy 625	Alloy 625										
NACE	Specially treated 316 or 410 trim combined with B7M bolts and 2HM nuts to meet NACE MR-01-75 requirements.														
Full Stellite	Full Hard faced trim, suitable for abrasive & severe services up to 1200°F (650°C).														

NOTE: Cr = Chromium Ni = Nickel Co = Cobalt Cu = Copper N/A = Not Applicable.

① API lists as obsolete but still used in the valve industry. (Trim# 1 is still used for API600 gates as well as globe & check valves). Trim #4 replaces Trim #1. Also, even though API no longer references trim# 2, for API603 gate, globe & check, (and in some commodity API600 gate valves in lower classes and under 300NB) it is still manufactured as it is specified by clients.

Ⓐ HB (formerly BHN) is the symbol for Brinell Hardness per ASTM E10.

Ⓑ Free Machine grades of 13Cr are prohibited.

Ⓒ Body and disc seat surfaces should be 250HB minimum with a 50HB minimum differential between the body and disc seat surfaces.

Ⓓ Manufacturer's standard hardness.

Ⓔ Differential hardness between the body and disc seat surfaces is not required.

Ⓕ Case hardness by nitriding to a thickness of 0.13 mm (0.005 in.) minimum.

Ⓖ AWS A5.13 ECoCr-A or AWS A5.21 ERCoCr-A: This classification includes such trademark materials as Stellite 6™, Stoody 6™ and Wallex 6™. For Plasma Transfer Arc Welding (PTAW) process powder with the metallurgy equivalents to UNS R30006 can also be used. CoCr-E (Stellite 21™* or equal) may be used only with purchaser approval and typical CoCr-E alloys include AWS A5.13 ECoCr-E or AWS A5.21 ERCoCr-E.

Ⓗ Manufacturer's standard hardfacing with a maximum iron content of 25%.

Ⓙ Hardness differential between the body and disc seat surfaces shall be the manufacturer's standard. Trim materials and base material for HF trim items, shall have a corrosion resistance and temperature limit at least equal to the valve body's corrosion resistance and pressure temperature rating.

Ⓚ Manufacturer's standard with 30 Ni minimum.

Ⓜ Example only.

Ⓝ Per manufacturer's standard if not Hard faced, 250 HB minimum if Hard faced.

Ⓩ Trim materials, including stem and base material for HF trim items, shall have a corrosion resistance and temperature limit at least equal to the valve body's corrosion resistance and pressure temperature rating.

* This term is used as an example only, and does not constitute an endorsement of this product by APV.

Important Note: Data provided in this chart is for informational purposes only. Always consult current API publications to verify information (as of Feb 2017 API Table 8). Note API600 is only designed for steel bolted bonnet gate valves and specific hardness requirements. Do not literally apply to globe & check valves. Australian Pipeline Valve recommend that customer's engineers analyse service requirements and specify the materials they consider optimum for their service conditions. Temperatures shown will vary depending on service applications, pressure and media type.

† The API600 trim chart specifications are primarily designed for API600 Gate valves. For API603 gate valves as well as globe valves and check valves, the same trim numbers are more loosely applied (API603 does not reference a trim chart as of 2017). In regard to globe and check valve, the hardness differentials shown above on the disc and seat aren't mandatory by many end users (and manufacturers are not required to follow the latest version of API600 unless client requires it) as wear, gauling, sticking etc., is not such an issue with globe & check valves. In large parts of the world globe valves and check valves are ordered as BS1873 & BS1868 not API (BS spec is now converted to ISO specification). However, major manufacturers like APV manufacture gobe valves to API 623 & swing check valves to API 594. Check valves are also manufactured to API6D specifications. In regard to API602, the same identical trim chart is specified in the latest version of API602. Once again, for globe and check valves traditionally the BS specification (now ISO specification) has been adopted by many manufacturers.

TRIM SERVICE APPLICATIONS & OLD BS DESIGNATION

API Trim Number	Service	Old BS Designation
1[1]	For oil and oil vapors and general services with heat treated seats and wedges. General very low erosive or non-corrosive service between -100ºC and 320ºC. This stainless steel material lends itself readily to hardening by heat treatment and is excellent for contacting parts such as stems, gates, and discs. Steam, gas & general service to 370ºC. Oil & Oil vapor 480ºC.	Cr13
2[1]	For moderate pressure in corrosive, low erosive service between -265ºC and 450ºC.	18-8Ti
3	For moderate pressure in corrosive or non corrosive service between -265ºC and 450ºC.	25-20
4	Seats 275 BHN min. As trim 1 but for medium pressure and more corrosive service.	HF
5	High pressure slightly erosive and corrosive service between -265ºC and 650ºC and higher pressure. Premium trim service to 650ºC. Excellent for high pressure water and steam service.	HF
5a	As trim 5 where Co is not allowed.	HF
6	As trim 1 and more corrosive service.	Cr and Cu-Ni
7	Seats 750 BHN min. As trim 1 but for higher pressure and more corrosive/erosive service.	Cr and Cu-Ni
8	Universal trim for general service requiring long service life up to 593ºC. As trim 5 for moderate pressure and more corrosive service. Steam, gas & general service to 540ºC. Standard trim for gate valves.	Cr + HF
8a	As trim 5a for moderate pressure and more corrosive service.	Cr + HF
9	For corrosive service to 450ºC such as acids, alkalies, salt solutions, etc. Very corrosive fluids. Erosive-corrosive service between -240ºC and 480ºC. Resistant to sea water, acids, alkalies. Has excellent corrosion resistance in chlorine and alkylation service.	Ni-Cu
10	For superior resistance to corrosion for liquids and gases which are corrosive to 410 stainless steel up to 455ºC. As trim 2 but a higher level of corrosive service. Provides excellent resistance to corrosive media at high temperatures and toughness for service at low temperatures. Low temperature service standard for 316SS valves.	18/10/2002
11	As trim 9 but for medium pressure and more corrosive service.	HF-Ni
12	As trim 10 but for medium pressure and more corrosive or abrasive service.	-
13	Very corrosive service. For moderate pressure between -45ºC and 320ºC.	-
14	As trim 13 but for medium pressure and more corrosive service.	-
15	As trim 2 but more erosive service & higher pressure.	-
16	As trim 10 but more erosive service & higher pressure.	-
17	As trim 13 but more corrosive service & higher pressure. Combines good corrosion resistance with high temperature resistance up to 800ºC.	18-8 Nb
18	As trim 13 but more corrosive service & higher pressure. Water, gas or low pressure steam to 230ºC.	-
Bronze	Water, oil, gas, or low pressure steam to 232ºC.	-

[1] API lists as obsolete but still used in the valve industry. (Trim# 1 is still used for API603 gates as well as globe & check valves). Also, even though API no longer references trim# 2, for API603 gate, globe & check, (and in some commodity API600 gate valves in lower classes and under 300NB) it is still manufactured as it is specified by clients.

Important Note: Data provided in this chart is for informational purposes only. Always consult current API publications to verify information and trim date. Australian Pipeline Valve recommend that customer's engineers analyse service requirements and specify the materials they consider optimum for their service conditions. Temperatures shown will vary depending on service applications, pressure and media type.

TRIM MATERIAL EQUIVALENT GRADES

TRIM	UNS	TYPE	GRADE (forged)	ASTM (wrought)	DIN	DIN W No.
F6	UNS S41000	13Cr	ASTM A182 F6a	A4276-410	DIN X12Cr13	1.4006
304	UNS S30400	18-8 Cr-Ni	ASTM A182 F304	A276-304	DIN X5CrNi 18 10	1.4301
316	UNS S31600	18-8 Cr-Ni (18-10-2)	ASTM A182 F316	A276-316	DIN X5CrNiMo 18 10	1.4401
321	UNS S32100	18 Cr-10 Ni-Ti	ASTM A182 F321	A276-321	DIN X6CrNiTi 18 10	1.4541
347	UNS S34700	18 Cr-10 Ni-Cb	ASTM A182 F347	A276-347	DIN X6CrNiNb 18 10	1.455
MONEL®	UNS N04400	67Ni-30Cu	ASTM B564-N04400	B164-N04400	DIN 17743	2.436
ALLOY 20	UNS N08020	28Ni-19Cr-Cu-Mo	ASTM A182-F20*	ASTM B473	DIN 14500	2.466
ALLOY 625	UNS N06625	60Ni-22Cr-9Mo-3.5Cb	ASTM B564-N06625	ASTM B564-N06625	DIN 17361	2.4865
C276	UNS N10276	54Ni-15Cr-16Mo	ASTM B564-N10276	ASTM B574-N10276	DIN NiMo 16 Cr 15 W	2.4819
17/4PH	UNS S17400	0C417Ni4Cu4Nb	ASTM A4750 UNS S17400	ASTM A4705 UNS S17400	X5CrNiCuNb17-4-4	1.4548
St. Gr6	UNS R30006	Co Cr-A	AMS 5894	Stellite® Gr6		

* No longer listed in ASME B16.34 - 2009.

For technical references and ASTM/ASME cross reference information on stainless, duplex, chrome-moly and alloy steel used in valves & piping systems in the petrochemical and refining go to our website: www.australianpipelinevalve.com.au.

We can manufacture exotic grades like Nickel, Super Duplex F55 (6A/CD3MWCuN), F51 (4A/CD3MN), Monel (ASTM A494-M35-1), Hastealloy C (ASTM A-494 C12MW), F317 (CG8M), etc., in short lead-time.