

## VALVE MATERIALS - SUITABILITY, PERFORMANCE, APPLICATIONS & CROSS REFERENCES

### COMPLETE VALVE SOLUTIONS FOR ALL INDUSTRIES

Australian Pipeline Valve (APV) offers valves in a wide variety of material combinations in carbon steel, stainless steels, exotic and special materials. Australian Pipeline Valve manufactures the following valves in all grades:-

- Ball Valves (Firesafe & non Firesafe)
- Check Valves (Piston, Swing, Tilt)
- Wafer Check Valves (Dual flap/ Single flap)
- Gate Valves (API603 & API600)
- Globe Valves (ANSI B16.34 & BS1873)
- Needle Valves (Plug and Globe type)
- Plug Valves (Lined & Sleeved)
- Strainers (Y, Basket & Duplex type)

#### Major Categories of Common Valve Materials

| FORGED   | CAST                      |
|--|---------------------------|
| <b>CARBON STEEL</b>                            |                           |
| ASTM A105/A105N                                | ASTM A216 WCB/WCC         |
| ASTM A350 LF2                                  | ASTM A352 LCB/LCC         |
| <b>ALLOY STEEL</b>                             |                           |
| ASTM A350 LF3                                  | ASTM A352 LF3             |
| ASTM A182 F5a/F5                               | ASTM A217 C5              |
| ASTM A182 F9                                   | ASTM A217 C12             |
| ASTM A182 F11                                  | ASTM A217 WC6             |
| ASTM A182 F22                                  | ASTM A217 WC9             |
| ASTM A182 F91                                  | ASTM A217 C12A            |
| <b>AUSTENITIC STAINLESS STEEL</b>              |                           |
| ASTM A182 F304/F304L                           | ASTM A351 CF8/CF3         |
| ASTM A182 F316/F316L                           | ASTM A351 CF8M/CF3M       |
| ASTM A182 F321                                 |                           |
| ASTM A182 F347                                 | ASTM A351 CF8C            |
| ASTM A182 F44 (6MO)                            | ASTM CK3MCuN              |
| ASTM A182 F20* (ALLOY 20)                      | A351 CN7M                 |
| <b>FERRITIC-AUSTENITIC STAINLESS STEEL</b>     |                           |
| ASTM A182 F51 - UNS S31803† (DUPLEX S.S.)      | A995* GR.4A/A351 CD3MN    |
| ASTM A182 F53 - UNS S32750 (SUPER DUPLEX S.S.) | A995* GR.5A/A351 CE3MN    |
| ASTM A182 F55 - UNS S32760 (SUPER DUPLEX S.S.) | A995* CD3MWCuN/A995 CR.6A |
| <b>NICKEL ALLOY</b>                            |                           |
| INCONEL 825 - UNS N08825 - ASTM B564 N08825    | A484 CU 5MCu*             |
| INCONEL 600 - UNS N06600 - ASTM B564 N06600    | A494 CY40*                |
| INCONEL 625 - UNS N06625 - ASTM B564 N06625    | A494 CW6MC*               |
| MONEL 400 - UNS N04400 - ASTM B564 N04400      | A494 M35-1                |
| <b>TITANIUM</b>                                |                           |
| ASTM B381 GR.F2                                | ASTM B367 GR.C2           |
| ASTM B381 GR.F3                                | ASTM B367 GR.C3           |

†Grade UNS31803 now supplemented by UNS32205. UNS32205 which dual conforms and is now often specified.

\*A995 optionally supersedes A890. A890 is now only used for non pressure retaining parts.

## 304/304L STAINLESS VALVES

Valves are manufactured in ASTM A182 304/304L forgings and ASTM A351 CF8/CF3 castings. Trim components can also be in UNS S30403 and AISI-SAE 304/304L. Welded end valves can be in 304 but 304L is often preferred due to the lower carbon content which avoids intergranular corrosion in the as-welded state thereby providing superior corrosion resistance compared to 304.

### Design features 304/316L Stainless Steel

- General corrosion resistance
- Non magnetic and non hardenable except by cold working
- Appropriate in field working applications
- Susceptible to chloride stress corrosion cracking

## GRADE 304

One of the most versatile and commonly used stainless steels on the market, Grade 304 stainless steel is the most standard used alloy of this type. Essentially, Grade 304 is an austenitic chromium alloy which is also known as an “18/8” stainless as the make-up of the steel is 18% chromium and 8% nickel. 304 grade is also cheaper than 316 grade.

The chromium content promotes the material’s considerable resistance to the effects of corrosion and oxidation. The stainless steel alloy resists most oxidising acids and will withstand ordinary rusting though this does not mean that the steel will not tarnish over time. The steel needs to be cold worked to generate higher tensile strength. For valves which are welded heavily, post-weld annealing may be necessary to provide maximum corrosive resistance.

Type 304 Stainless Steel has excellent welding and deep drawing characteristics.

### Applications of Grade 304 Stainless Steel

Grade 304 can also be found in heat exchangers, chemical containers, pipelines and throughout the food industry. It can be used as a fabricated material where high temperature petroleum gases or steam production gases are stored such as pressure vessels.

304 & 304L valves & piping components have similar properties and in certain cases are manufactured with dual certification, where it is confirmed that each item has properties and a composition which comply with both steel types. Grade 304H cannot be included in this equation due to the steel’s higher carbon content which is intended for use in elevated temperature applications.

## GRADE 304L

Type 304L is a lower carbon variant of Grade 304 - the steel can be welded without the resulting issue of carbon precipitation (precipitation of chromium carbide as heat is applied during the welding process which depletes the chromium element of the steel thus reducing its anti-corrosive/oxidation effectiveness). It’s corrosive and strength properties are similar to 304.

Type 304L stainless steel is a sort after material for use in severely corrosive conditions. Weld annealing is only necessary in applications where stress loads are excessive. 304L has a slightly lower pressure rating at very high temperatures compared to 304.

This steel Grade is found in a variety of commercial sectors, particularly in the chemical industry.

## Benefits of using 304L Stainless Steel

- Low carbon content eliminates carbon precipitation in the welding process
- Can be used in severe corrosive environments
- Weld annealing only required in high stress applications
- Very similar to Type 304

304 & 304L valves & piping components have similar properties and in certain cases are manufactured with dual certification, where it is concluded that each item has properties and a composition which comply with both steel types. Grade 304H cannot be included in this equation due to the steel's higher carbon content which is intended for use in elevated temperature applications.

The below tables are correct as per ASTM A182/A182M-13

## Chemical Composition

| Grade | C (Max) | Si (Max) | Mn (Max) | P (Max) | S (Max) | Cr          | Mo | Ni        | N (Max) |
|-------|---------|----------|----------|---------|---------|-------------|----|-----------|---------|
| 304L  | 0.030   | 1.00     | 2.00     | 0.045   | 0.030   | 18.00/20.00 | -8 | .00/13.00 | 0.10    |
| 304   | 0.080   | 1.00     | 2.00     | 0.045   | 0.030   | 18.00/20.00 | -8 | .00/11.00 | 0.10    |

## Mechanical Properties

| Grade | Yield Strength<br>Min (Mpa) | Tensile Strength<br>Min (Mpa) | Elongation (%)<br>Min | Reduction of Area (%)<br>Min (50mm) | Hardness Max |     |
|-------|-----------------------------|-------------------------------|-----------------------|-------------------------------------|--------------|-----|
|       |                             |                               |                       |                                     | HB           | HRB |
| 304L  | 170                         | 485                           | 30                    | 50                                  | 201*         | 92* |
| 304   | 205                         | 515                           | 30                    | 50                                  | 201*         | 92* |

\* Maximum hardness not specified in ASTM A182/A182M-13

## Equivalent Standards/ Specifications

The following standards may be utilised for valve & trim components in valve construction:-

### ASTM

A312, A376, A358, A269, A249, A403, A182, A351

### ASME

SA312, SA376, SA358, SA269, SA249, SA403, SA182, SA351

## Applications

| FORGING SPECIFICATION | COMMON DESIGNATION  | MATERIAL SUFFIX      | WROUGHT BAR SPECIFICATION | SERVICE RECOMMENDATIONS (1)  | COMMON API TRIM# FOR BASE MATERIAL |              |
|-----------------------|---|----------------------|---------------------------|--|------------------------------------|--------------|
|                       |   |                      |                           |  | 150 TO 600#                        | 900 TO 2500# |
| ASTM A182 F304        | 18% Chrome; 8% Nickel; 0.08% C Stainless Steel            | ASTM A351 Grade CF8  | ASTM A479 304             | Corrosive or extremely high temperature non-corrosive services between -450°F (-268°C) and +1200°F (+649°C). Above +800°F (+425°C) specify carbon content of 0.04% or greater. | 2                                  | 2, 15        |
| ASTM A182 304L        | 18% Chrome; 8% Nickel; 0.03% C Low Carbon Stainless Steel | ASTM A351 Grade CF3  | ASTM A479 304L            | Brackish water, phosphate solutions, pressurised water @ 570°F (299°C), sea water, steam   | 304L+HFS                           | 304L+HF      |
| ASTM A182 F304H       | 18% Chrome; 8% Nickel; 0.08% C Stainless Steel            | ASTM A351 Grade CF10 | ASTM A479 304H            | Corrosive or extremely high temperature non-corrosive services between -450°F (-268°C) and +1200°F (+649°C). Above +800°F (+425°C) specify carbon content of 0.04% or greater. | 304H+HFS                           | 304H+HF      |

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 the technical section of our website: <http://www.australianpipelinevalve.com.au>

## 316/316L STAINLESS VALVES

Valves are manufactured in ASTM A182 316/316L forgings and ASTM A351 CF8/CF3 castings. Trim components can also be in UNS S31600 and AISI-SAE 316/316L. Welded end valves can be in 316 but 316L is often preferred due to the lower carbon content which avoids inter granular corrosion in the as-welded state thereby providing superior corrosion resistance compared to 316. However, 316 can be post-weld annealed to promote maximum corrosion resistance.

316 and 316L are molybdenum steels with enhanced resistance to pitting by solutions with chlorides and other halides. These grades offer tensile, creep and stress-rupture strength in higher-temperature applications. 316 and 316L offer better resistance to atmospheric and mild environments than 304 and 304L.

### Design Features 316/316L

- 316 is resistant to dilute solutions (1-5%) of sulfuric acid to 49°C (120°F), except in some oxidising acids, where 316 is less resistant than 304.
- 316 is susceptible to inter granular corrosion in the as-welded condition
- 316 is prone to carbide precipitation from 427°C to 816°C (800°F to 1500°F)
- Corrosion resistance can be restored by post-welding annealing
- 316L offers same composition but with less than 0.03% carbon
- 316L presents similar corrosion resistance and other characteristics as 316 but with added resistance to inter granular attack in the as-welded condition or with short exposures in the 427°C to 816°C (800°F to 1500°F) range
- 316L is appropriate in applications where it's impossible to avoid exposure in the carbide precipitation range and when post-welding annealing isn't practical; lengthy exposure in this range may make the material brittle and susceptible to inter granular attack
- 316 maximum temperature for scaling resistance is 899°C (1650°F) in continuous service and 816°C (1500°F) in intermittent service applications
- 316L has a slightly lower pressure rating at very high temperatures compared to 316
- Susceptible to stress-corrosion cracking
- Slightly magnetic in the cold-worked condition
- Nonmagnetic and non harden able in the annealed condition
- Enhanced resistance to chlorides

## GRADE 316

After 304, 316 is the most common stainless steel on the market. It is an austenitic grade with the addition of 2-3% molybdenum which further improves corrosion resistance. It is often referred to as a marine grade stainless steel because of its effective resistance to chloride corrosion in comparison to other stainless steel grades.

The material has superior welding and forming qualities. Grade 316 will require post-weld annealing to promote maximum corrosion resistance, though this is not necessary if Type 316L is used.

### Applications of Grade 316 Stainless Steel

Typical applications for this material are now widespread due to its superior corrosion resistance properties when compared to Grade 304. Type 316 stainless can be found in heat exchangers, pharmaceutical equipment, refineries, food industry, mining, process industries, etc.

316 & 316L steel valves have common properties and are often manufactured by Australian Pipeline Valve with dual certification, where it is determined that both have properties and composition which comply with both steel types.

Type 316H is excluded from this overview but as a brief explanation, 316H is engineered to constantly work in even higher working temperatures than 316/316L. It should also be noted that 316L has a slightly lower maximum temperature rating and maximum cold working pressure rating than 316.

## GRADE 316L

Type 316L is the low carbon version of 316 stainless. Again compared to 304/304L having the addition of molybdenum, the steel is popular for use in severe corrosion environments due to the materials immunity from boundary carbide precipitation (sensitisation) caused by welding.

Weld annealing is only required where the material is for use in high stress environments. 316L has an extensive variety of uses especially in highly corrosive applications.

### Benefits of using Type 316L Stainless Steel

- Low carbon content eliminates carbon precipitation in the welding process
- Can be used in severe corrosive environments
- Improved anti-corrosion scope due to added molybdenum
- Very similar to Grade 316 in chemical composition and mechanical properties

316 & 316L valves have common properties and are often manufactured by Australian Pipeline Valve with dual certification, where it is determined that both have properties and composition which comply with both steel types.

*The below tables are correct as per ASTM A182/A182M-13*

### Chemical Composition

| Grade | C (Max) | Si (Max) | Mn (Max) | P (Max) | S (Max) | Cr          | Mo        | Ni          | N (Max) |
|-------|---------|----------|----------|---------|---------|-------------|-----------|-------------|---------|
| 316L  | 0.030   | 1.00     | 2.00     | 0.045   | 0.030   | 16.00/18.00 | 2.00/3.00 | 10.00/15.00 | 0.10    |
| 316   | 0.080   | 1.00     | 2.00     | 0.045   | 0.030   | 16.00/18.00 | 2.00/3.00 | 10.00/14.00 | 0.10    |

### Mechanical Properties

| Grade | Yield Strength<br>Min (Mpa) | Tensile Strength<br>Min (Mpa) | Elongation (%)<br>Min | Reduction of Area (%)<br>Min (50mm) | Hardness Max |     |
|-------|-----------------------------|-------------------------------|-----------------------|-------------------------------------|--------------|-----|
|       |                             |                               |                       |                                     | HB           | HRB |
| 316L  | 170                         | 485                           | 30                    | 50                                  | 217*         | 95* |
| 316   | 205                         | 515                           | 30                    | 50                                  | 217*         | 95* |

*\* Maximum hardness not specified in A182/A182M-13*

### Equivalent Standards/ Specifications

The following standards may be utilised for valve & trim components in valve construction:-

#### ASTM

A312, A376, A358, A269, A249, A403, A182, A351

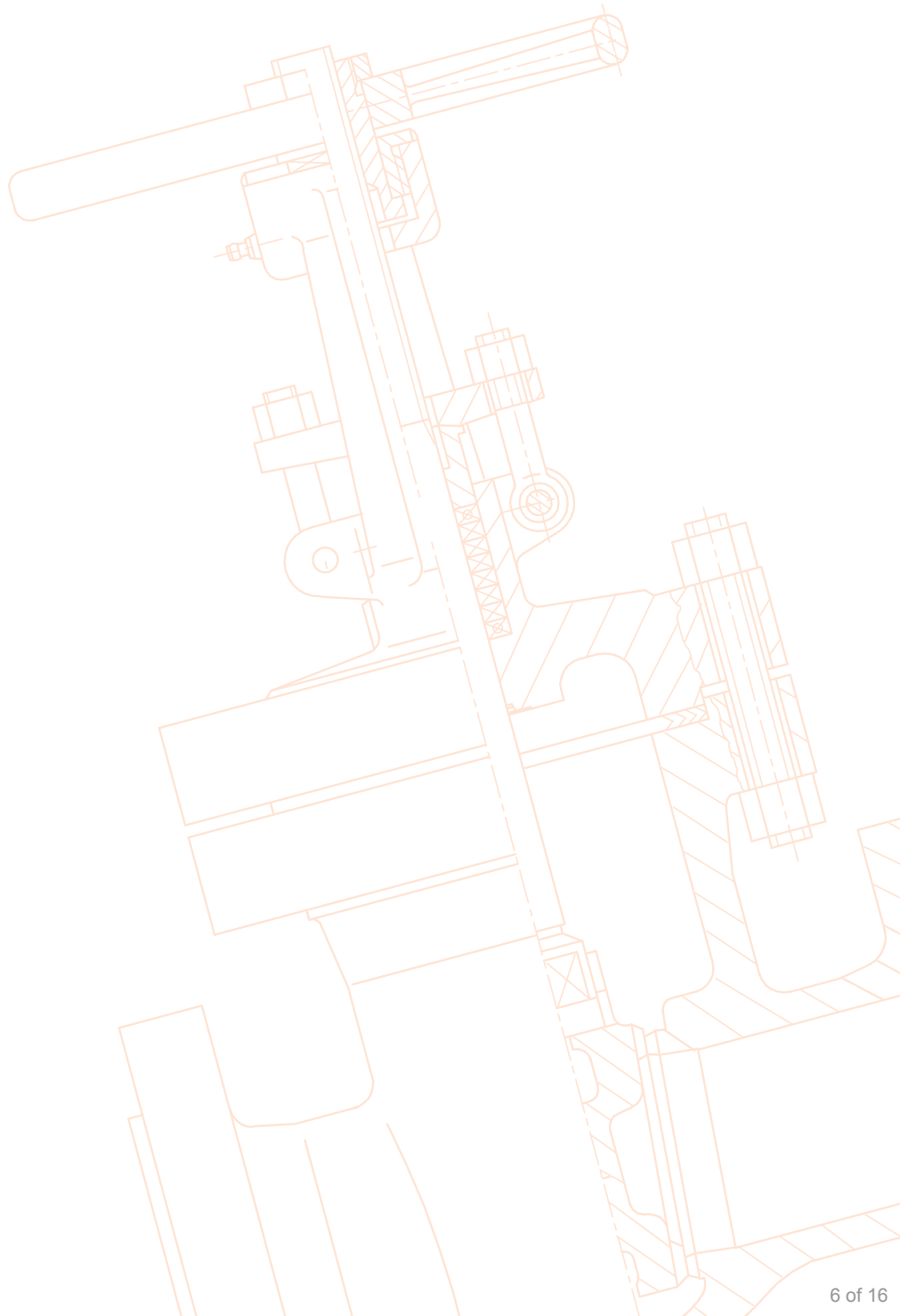
#### ASME

SA312, SA376, SA358, SA269, SA249, SA403, SA182, SA351



## Applications

| FORGING SPECIFICATION | COMMON DESIGNATION  | MATERIAL SUFFIX       | WROUGHT BAR SPECIFICATION | SERVICE RECOMMENDATIONS (1)   | COMMON API TRIM# FOR BASE MATERIAL |              |
|-----------------------|---|-----------------------|---------------------------|---|------------------------------------|--------------|
|                       |   |                       |                           |   | 150 TO 600#                        | 900 TO 2500# |
| ASTM A182 F316        | 18% Chrome; 12% Nickel; 2% Mo; 0.08% C Stainless Steel            | ASTM A351 Grade CF8M  | ASTM A479 316             | Corrosive or extremely low or high temperature non-corrosive services between -450°F (-268°C) and +1200°F (+649°C). Above +800°F (+425°C) specify carbon content of 0.04% or greater. | 10, 12                             | 12, 16       |
| ASTM A182 316L        | 18% Chrome; 12% Nickel; 2% Mo; 0.03% C Low Carbon Stainless Steel | ASTM A351 Grade CF3M  | ASTM A479 316L            | Acetic acid, calcium carbonate, calcium lactate, potable water, sea water, steam, sulfites  | 316L+HFS                           | 316L+HF      |
| ASTM A182 F316H       | 18% Chrome; 8% Nickel; 2% Mo; 0.08% C Stainless Steel             | ASTM A351 Grade CF10M | ASTM A479 316H            | Corrosive or extremely high temperature non-corrosive services between -450°F (-268°C) and +1200°F (+649°C). Above +800°F (+425°C) specify carbon content of 0.04% or greater.        | 310H+HFS                           | 310H+HF      |



## DUPLEX STAINLESS VALVES (F51/F53/F55/S31803/2205/CD3MN/CE3MN)

Australian Pipeline Valve manufactures valves in duplex stainless steel materials such as forged ASTM A182-F51 cast A351-CD3MN and ASTM A351 CE8MN/CD4MCuN. Other grades are exotic and special stainless steels such as Super Duplex forged A182 F53 and A182 F55 (Zeron 100) and it's cast equivalent A995 Grade 6A (CD3MWCuN) and A182 F44 and it's cast equivalent A351 CK3MCuN are available upon request. Duplex A182-F51 is equivalent to:- UNS31803† and DIN 1.4462 and it is similar to:- 329LN, SAF2205, Uranus 45N.

### F51/2205/CD3MN DUPLEX STEEL

Duplex stainless is a mixed microstructure of austenitic and ferrite (50/50) which has improved strength over ferritic and austenitic steel grades with similar corrosion resistance qualities.

#### Benefits of using Duplex Stainless Steel

- Similar corrosion resistance to Type 316
- Greater tensile and yield strength
- Good ductility and toughness
- Good stress corrosion cracking resistance (SSC)

Duplex stainless steel is designed to combine improved resistance to stress corrosion cracking (including sulfide stress corrosion cracking), pitting, crevice corrosion and high strength when compared with other stainless alloys. This alloy resists chloride environments and sulfide stress corrosion. It is also roughly double the strength of standard austenitic stainless steels.

#### Applications

- Petrochemical
- Desalination plants
- Chemical processing and transportation
- Chloride-handling industries
- Valve stems

#### Metallurgical Chemical Composition

| UNS S31803/A182 F51/1.4462 |       |      |       |       |       |       |       |      |
|----------------------------|-------|------|-------|-------|-------|-------|-------|------|
| C                          | Cr    | Mn   | Mo    | N     | Ni    | P     | S     | Si   |
| 0.030                      | 21.0- | 2.00 | 2.50- | 0.08- | 4.50- | 0.030 | 0.020 | 1.00 |
| max                        | 23.0  | max  | 3.50  | 0.20  | 6.50  | max   | max   | max  |

Correct as per A182/A182M-13. Based on A182 F51 (UNS31803 is equivalent)

| UNS S32205 |       |      |       |       |       |       |       |      |
|------------|-------|------|-------|-------|-------|-------|-------|------|
| C          | Cr    | Mn   | Mo    | N     | Ni    | P     | S     | Si   |
| 0.030      | 22.0- | 2.00 | 3.00- | 0.14- | 4.50- | 0.030 | 0.020 | 1.00 |
| max        | 23.0  | max  | 3.50  | 0.20  | 6.50  | max   | max   | max  |

#### Metallurgical Mechanical Properties A182 F51

| Yield Strength   | Tensile Strength | Elongation (Min) | Reduction of Area (50mm) | Charpy Impact @ Rt J | Hardness HB |
|------------------|------------------|------------------|--------------------------|----------------------|-------------|
| >450 Mpa (65KSI) | >620 Mpa (90KSI) | 25%              | 45%                      | 100*                 | 270HB* Max  |

Correct as per ASTM A182/A182M-13. (UNS31803 is similar but slightly different).

\* Not shown in ASTM A182/A182M-13

PREn = Pitting Resistance Equivalent

PREn = Cr% + 3.3Mo% + 16N%

## Applicable Standards

As well as ASTM A182 and A351 other standards such as ASTM A240, A789 and A790 also cover Duplex grades of valve bodies and trim materials.

| Trade Name | UNS         | Industry Specifications   |
|------------|-------------|---|
| SAF 22005  | UNS S31803* | <b>ASME</b> SA-182 (F51), SA-240, SA-798, SA-790, SA-815<br><b>ASTM</b> A240, A276, A479, A789, A790, A815, A923, A928, A988<br><b>SAE</b> J405 |
| SAF 2205   | UNS S32205  | <b>ASTM</b> A240, A240M, A276, A479, A480, A480M, A798, A7901, A815, A923, A928, A988<br><b>SAE</b> J40   |

\* UNS31803 has been supplemented by S32205 (F60).

## General Duplex Stainless Steel Information

2205 is the most widely used duplex (ferritic/austenitic) stainless steel grade. It finds applications due to both excellent corrosion resistance and high strength. The standard duplex S31803 (A182 F51) composition has been refined over many years, and the resulting composition range was endorsed as UNS S32205 in 1996. Duplex S32205 provides excellent guaranteed corrosion resistance, but it should be noted much of the Duplex S31803 currently produced also dual conforms with Duplex S32205. 2205 is not generally suitable for use at temperatures above 300°C as it suffers from precipitation of brittle micro-constituents, nor below -50°C because of its ductile-to-brittle-transition.

## Equivalent Grades

| ASTM GRADE     | A990-1A*     | A990/A995-1B  | A990-1C*      | A990/A995-2A*      | A990/A995-3A* | A990/A995-4A*  | A990/A995-5A*      | A990/A995-6A    | A990/A995-7A            |                 |
|----------------|--------------|---------------|---------------|--------------------|---------------|----------------|--------------------|-----------------|-------------------------|-----------------|
| Type           | 25Cr5NiMoCu  | 25Cr5Ni2Mo3Cu | 25Cr6NiMoCuN  | 24Cr10Ni4MoV       | 25Cr5NiMoV    | 22Cr5Ni3MoN    | 25Cr7Ni4MoN        | 27Cr7Ni3.5MoWcb | 27Cr7Ni-Mo-W-N          | 25Cr7Ni3.5MoWcb |
| UNS No.        | J93370       | J93372        | J93373        | J93345             | J93371        | S31803/S32205† | S32750             | S32760          |                         | S31254          |
| ASTM No.       | A351-CD4MCuN | A995-1B       | A351-CD3MCuN* | A351-CE8MN/CD3MCuN | A351-CD6MN    | A351-CD3MN     | A351-CE3MN         | A351-CD3MWCuN   | A351-CD3MWN             | A351-CK3MCuN    |
| Forged Equiv.  | A182-F50*    |               | F61*          |                    |               | A182-F51       | A182-F53           | A182-F55        | (Zeron 100™)            | A182-F44        |
| Common Name    | Duplex       | Duplex        | Duplex        | Duplex             | Duplex        | Duplex 2205    | Super Duplex 32750 | Super Duplex    | Super Austenitic/Duplex | Super Duplex    |
| European (DIN) |              |               |               |                    |               | 1.4462         | 1.4410             | 1.4501          | UNS J93379              |                 |

† S31803 has been supplemented by S32205 which has a higher minimum N, CR and Mo.

\* Not referenced in ASME B16.34 - 2009.

A995 optionally supersedes A990 (1A and 1C are not referenced in A995). ASME B16.34 now only references A995. A890 is no longer used for pressure retaining castings

## Applications

| FORGING SPECIFICATION | COMMON DESIGNATION  | MATERIAL SUFFIX                          | WROUGHT BAR SPECIFICATION | SERVICE RECOMMENDATIONS (1)  |
|-----------------------|---|--|---------------------------|--|
| ASTM A182 F44         | 20% Chrome; 18% Nickel; 6% Mo; 0.25% C Super Stainless Steel                  | ASTM A351 Grade CK3MCuN Super Austenitic | ASTM A479 S31254          | (2.54 SMO) Acetic acid, antibiotics and drugs, bleaching compounds, formic acid, fruit and juices, hot air, hot water, hydrocarbons, hydrochloric acid, organic liquids and acids, nitric acid, organic salts, oxalic acid, phosphoric acid, sea water, sewage, sodium bisulfite, steam, sulfuric acid, 10% sulfuric acid. |
|                       | 25.5% Chrome; 5.5% Nickel; 2% Mo; 0.040% C Super Stainless Steel              | ASTM A351 Grade CD4MCu                   | ASTM A479 S32550          | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics).  |
|                       | 24% Chrome; 9.5% Nickel; 4% Mo; 0.080% C Duplex Stainless Steel               | ASTM A351 Grade CE8MN                    |                           | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics).  |
| ASTM A182 F51         | 22% Chrome; 5% Nickel; 3% Mo; N; 0.030% C Duplex Stainless Steel              | ASTM A351 Grade CD3MN                    | ASTM A479 31803           | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics).  |
| ASTM A182 F53         | 25% Chrome; 7% Nickel; 4.5% Mo; N; 0.030% C Duplex Stainless Steel Grade 5A   | ASTM A995 Grade CE3MN                    |                           | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics). Useful when the Pitting Resistance Number (PREN) is required.  |
|                       | 25% Chrome; 7.5% Nickel; 3.5% Mo; N; 0.030% C Duplex Stainless Steel Grade 6A | ASTM A995 Grade CD3MWCuN 6A              |                           | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics). Useful when the Pitting Resistance Number (PREN) is required.  |



## SPECIALITY ALLOY VALVES A20/MONEL

Forged Alloy 20 (ASTM A182 F20) and its cast equivalent A351 CN7M is a specialty grade of Austenitic Stainless steel often referred to as 'super' stainless steels. Forged Monel 400 (UNS N14400) and its cast equivalent A494 M35-1 are Nickel Copper Alloy Steels as is Monel K500. Australian Pipeline Valve can also manufacture valves in other Nickel Alloys such as 600, 625, and 825. We can also manufacture other material grades of valves like hastelloy, titanium, etc.

### ALLOY 20 (A20)

Alloy 20 resists acid, general pitting attack, and chloride stress corrosion cracking. Ideal for fabrication and possessing exceptional mechanical capabilities. Alloy 20 can be welded with minimal carbide precipitation due to the inclusion of columbium. Alloy 20 is widely accepted for uses as diverse as chemical pharmaceutical processing, food, petrochemical and gasoline, solvents, plastics, synthetics, and explosives. Cast Alloy 20 grade A351-CN7M is suitable for service -46°C to 150°C.

'New Alloy 20' cast grade A990-CN3MCu is suitable for -29°C to 320°C. Forged Alloy 20 ASTM A182-F20 and B462 Grade N08062 (35Ni-35Fe-20Cr-Cb) is suitable up to 316°C.

#### Design Features

- Exceptional stress-corrosion resistance in boiling 20% to 40% sulfuric acid
- Sulfuric acid general corrosion resistance
- Ideal fabricability and mechanical characteristics
- Welding products minimal carbide precipitation

#### Applications

- Chemical and allied industries
- Pharmaceutical processing
- Food and dye
- Sulfur dioxide (SO<sub>2</sub>) scrubbers
- Pickling racks
- Tanks
- Severe environments

#### Alloy 20 Chemical Composition

| C     | Cb          | Cr        | Cu      | Mn  | Mo      | Ni        | P     | S     | Si  | Ta          |
|-------|-------------|-----------|---------|-----|---------|-----------|-------|-------|-----|-------------|
| MAX   | 8 Times     |           |         | MAX |         |           | MAX   | Max   | MAX | 8 Times     |
| 0.070 | Carbon-1.00 | 19.0-21.0 | 3.0-4.0 | 2.0 | 2.0-3.0 | 32.0-38.0 | 0.045 | 0.065 | 1.0 | Carbon-1.00 |

### MONEL

Monels are a Nickel alloy material with the addition of copper (Cu), Silicon (Si) and Manganese (Mn). These materials are also known as Monel, Alloy 400 and Alloy K500.

#### ASTM A296 gr. M-35 Monel (Monel 400) Chemical Composition

| C     | Cb          | Cr        | Cu      | Mn  | Mo      | Ni        | P     | S     | Si  | Ta          |
|-------|-------------|-----------|---------|-----|---------|-----------|-------|-------|-----|-------------|
| MAX   | 8 Times     |           |         | MAX |         |           | MAX   | Max   | MAX | 8 Times     |
| 0.070 | Carbon-1.00 | 19.0-21.0 | 3.0-4.0 | 2.0 | 2.0-3.0 | 32.0-38.0 | 0.045 | 0.035 | 1.0 | Carbon-1.00 |

## Common Material Specifications

### Ni Cu30 Fe3.5 Si1.5(+) (Monel 400)

- A494 M-35-1 (UNS N24135) (Low Si - weldable)
- A494 M-35-2 (UNS N04020)
- BS3071 : NA1
- BS3071 : NA3

### Others

- Wrought equivalent Alloy 400 (UNS N04400)

### Typical Properties

- Tensile 430 N/mm<sup>2</sup>
- Yield 170-205 N/mm<sup>2</sup>
- Elongation 20-25%
- Hardness HB 100-150
- Density 8.8 g/cm<sup>3</sup>
- Pressure temperature rating: B16.34 Group 3.4

### Corrosion Properties

- Good general corrosion for seawater service
- Especially good for higher flow rates
- Excellent trim material for NAB, gains cathodic protection with many alloys
- Not recommended for low velocities

### Additional Uses

- Variety of wrought/ bar specifications available, good for trim material. Excellent strength from K500
- Used for oxygen service
- Welded with lower Si content
- Excellent for hydrofluoric & other acids (not nitric)

### Cautions

- Ease of manufacture: trade-off between castability and weldability
- Pitting can be a problem at low velocities
- Don't use as trim for austenitic stainless

### Applications

| FORGING SPECIFICATION | COMMON DESIGNATION   | MATERIAL SUFFIX                      | WROUGHT BAR SPECIFICATION | SERVICE RECOMMENDATIONS (1)   | COMMON API TRIM# FOR BASE MATERIAL |              |
|-----------------------|--|--------------------------------------|---------------------------|---|------------------------------------|--------------|
|                       |  |                                      |                           |   | 150 TO 600#                        | 900 TO 2500# |
| ASTM B462 N08367      | 19% Chrome; 28% Nickel<br>Cu-Mo; 0.07% C Super<br>Stainless Steel  | ASTM A351<br>Grade CN7M (A20)        | ASTM B473<br>N08020       | Acetic acid (hot), brines, caustic solutions, (strong, hot), hydrochloric acid (dilute), hydrofluoric acid and hydrofluosilicic acid (dilute), nitric acid, (strong, hot), nitric-hydrofluoric pickling acids, sulfates and sulfites, sulfuric acid, all concentrations to 150°F (65.5°C), sulfuric acid, phosphoric acid.  | 13                                 | 14           |
| ASTM B462 N08020      | 19% Chrome; 28% Nickel;<br>Cu-Mo; 0.03% C Super<br>Stainless Steel | ASTM A351<br>Grade CN3MN             | ASTM B473<br>N08020       | Acetic acid (hot), brines, caustic solutions, (strong, hot), hydrochloric acid (dilute), hydrofluoric acid and hydrofluosilicic acid (dilute), nitric acid, (strong, hot), nitric-hydrofluoric pickling acids, sulfates and sulfites, sulfuric acid, all concentrations to 150°F (65.5°C), sulfuric acid, phosphoric acid. Better weldability properties than CN7M. | 13                                 | 14           |
| ASTM B564 N04400      | 67% Ni; 30% Cu, Monel  | ASTM A494<br>Grade M-35-1<br>(Monel) | ASTM B164<br>N04400       | Weldable grade. Good resistance to corrosion by all common organic acids and salt water. Also high resistant to most alkaline solutions to +725°F (+400°C)  | 9, 11                              | 9, 11        |

## LOW TEMPERATURE CARBON STEEL VALVES LCC/LCB/LF2

Australian Pipeline Valve manufactures a large range of carbon steel valves in low temperature carbon steel such as forged ASTM A350 LF2 and its cast equivalent ASTM A352 LCB. Higher grades such as ASTM A352 LCC and Alloy (Nickel) based forged carbon steel A350-LF3 and its cast equivalent A352-LC3 are also available on an indent basis. LF2 and LCB low temperature carbon steels are suitable for continuous service down to -46°C, up to 345°C. However alloy - Nickel based carbon steels like LCB, LF3, etc. are rated to lower temperatures (see below table). For cryogenic service colder than these temperatures austenitic stainless grades such as 304, 316 (CF8, CF8M) are required. Grades A352-LC4 and LC9 are no longer referenced in ASME B16.34 - 2009.

### Low Temperature Steel Types

| Steel Type            | Grade (forging) | Grade (cast) | Composition    | Min. Temperature |
|-----------------------|-----------------|--------------|----------------|------------------|
| Austenitic            | A182, F316      | A351 CF8M    | 18Cr, 8Ni, 2Mo | -196°C           |
| Nickel Based Steel    | A350 LF3        | A352 LC3     | 3 1/2 Ni       | -101°C           |
| Nickel Based Steel    | NO EQUIV        | A352 LC2     | 2 1/2 Ni       | -73°C            |
| Low Temp Carbon Steel | NO EQUIV        | A352 LC1     | 0.5 Mo         | -59°C            |
| Low Temp Carbon Steel | A350 LF2        | A352 LCB     | Carbon Steel   | -46°C            |

### Applications

Other than temperature capabilities, LF2 and LCB are suitable for the same standard service applications as outlined at this website for A105 and WCB such as steam, hydrocarbons and general industrial services. The main difference between LF2/ LCB and A105/ WCB is that LF2/LCB is Charpy impact tested at -46°C for this reason.

### Carbon Steel Grades

| Material Group               | Common Name  | Material Type | UNS    | Forging Spec. | Casting Spec. Equivalent | DIN                | Din W No. | Application  |
|------------------------------|--------------|---------------|--------|---------------|--------------------------|--------------------|-----------|--|
| Carbon Steel                 | CS           | C-Mn-Fe       | K03504 | A105N         | A216-WCB                 | C22.8 DIN 17243    | 1.0460    | General non-corrosive service from -29°C (-20°F) to 427°C (800°F)                    |
| Low Temperature Carbon Steel | LTCS         | C-Mn-Fe       | K03011 | A351-LF2      | A352-LCB<br>A352-LCC     | TSTE 355 DIN 18103 | 1.0566    | General non-corrosive service from -46°C (-50°F) to 340°C (650°F), LF2 -46°C ~ 427°C |
| Low Temperature Alloy Steel  | Nickel Steel | 3.1/2Ni       | K32025 | A350-LF3      | A352-LC3                 | 10Ni14             | 1.5637    | -101°C (150°F) to 340°C (650°F)  |

### ASTM Carbon Steel Types Key Chemical Properties

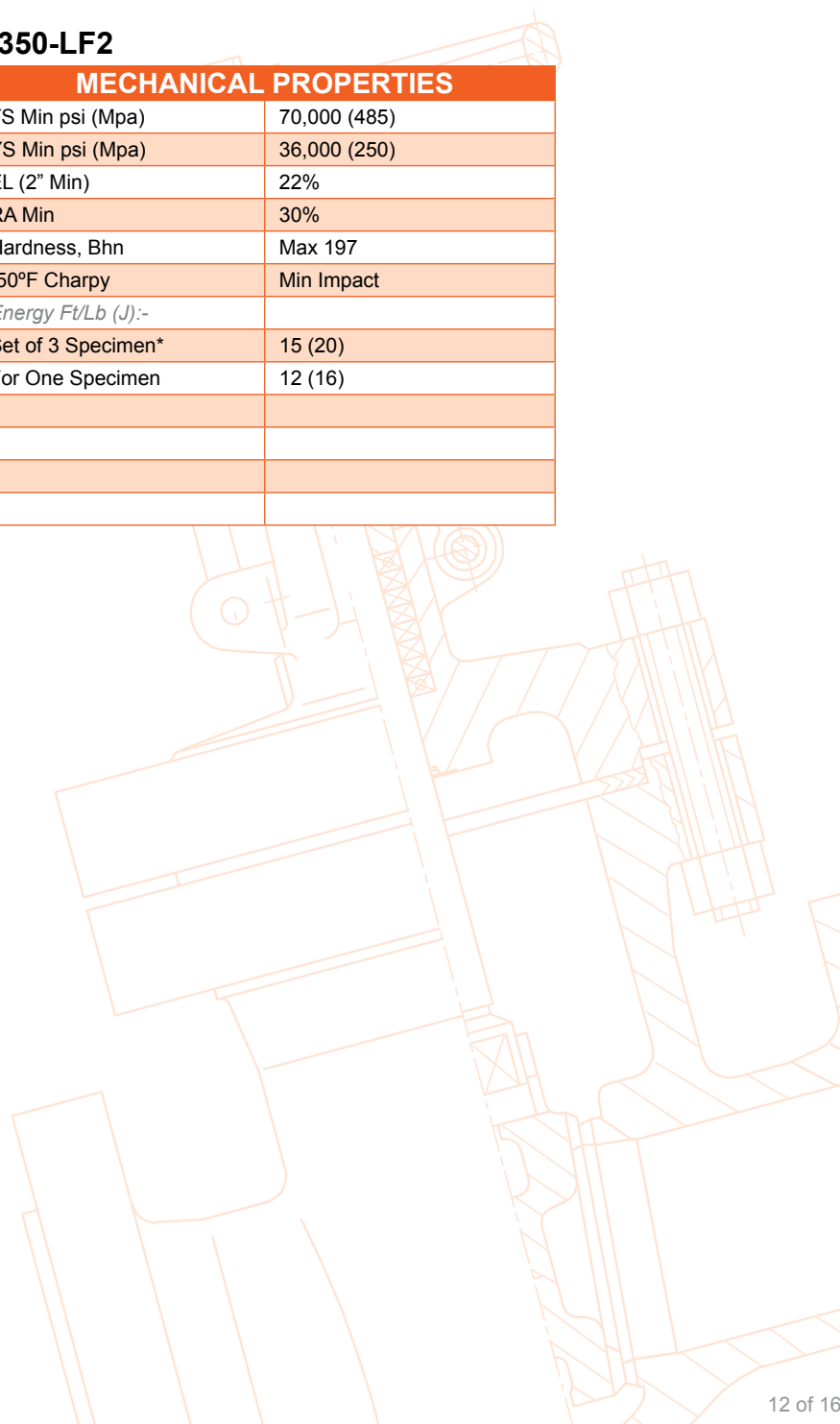
| KEY PHYSICAL PROPERTIES      | CAST     | FORGED   |
|------------------------------|----------|----------|
| <b>CARBON STEEL</b>          |          |          |
| 0.30/0.35 MAX C              | A216-WCB | A105     |
| 0.25/0.35 MAX C              | A216-WCC | A105N    |
| <b>LOW TEMPERATURE STEEL</b> |          |          |
| 0.25/0.30 MAX C              | A352-LCB | A350-LF2 |
| 0.5 Mo                       | A352-LC1 |          |
| 2.5 Ni                       | A352-LC2 |          |
| 3.5 Ni                       | A352-LC3 | A350-LF3 |
| C-MN-Si-V (0.25 Max)         | A352-LCC |          |
| C-Mn-Si-N (1.15~1.50 Mn)     |          | A350-LF6 |

### Chemical & Mechanical Composition A350-LF2

| CHEMICAL PROPERTIES    | MECHANICAL PROPERTIES |              |
|------------------------|-----------------------|--------------|
| C 0.30 Max             | TS Min psi (Mpa)      | 70,000 (485) |
| Mn 0.60 - 1.35         | YS Min psi (Mpa)      | 36,000 (250) |
| Si 0.15 - 0.30         | EL (2" Min)           | 22%          |
| P 0.35 Max             | RA Min                | 30%          |
| S 0.040 Max            | Hardness, Bhn         | Max 197      |
| Cr 0.30 Max            | -50°F Charpy          | Min Impact   |
| Ni 0.40 Max            | Energy Ft/Lb (J):-    |              |
| Mo 0.12 Max            | Set of 3 Specimen*    | 15 (20)      |
| V 0.08 Max             | For One Specimen      | 12 (16)      |
| Cb 0.02 Max            |                       |              |
| Cu 0.40 Max            |                       |              |
| Pb 0.02 Max            |                       |              |
| Total Residuals = 0.50 |                       |              |

\* Average

\* ASTM A350/A350M - 2012



## CARBON STEEL VALVES WCB/WCC/A105

Carbon steel valves are manufactured in forged ASTM A105 and its cast equivalent ASTM/A216-WCB. The European/DIN equivalent is C22.8 DIN17243 (1.0460). ASTM A216-WCC is also available. ASTM A216 WCC has a slightly higher pressure/ temperature rating than A216 WCB as it has a higher yield strength and a slightly higher manganese content. A216 LCC is basically the same as A216 WCC except it is charpies impact tested at -46°C for low temperature service. Refer to low temperature carbon steel overview previous page. A105 and WCB are for non corrosive service applications from -29°C (-20°F) to 427°C (800°F) for petrochemicals, gas, water, steam and general industrial applications. For H2S Sour Service, Australian Pipeline Valve manufactures carbon steel valves fully conforming to NACE MR0175/ISO 15156. This is specified for petroleum, natural gas and geothermal production services containing small amounts of H2S. For higher percentages of H2S, Australian Pipeline Valve also manufactures upstream wellhead, corrosion resistant, alloy valves and chokes manufactured in chrome-moly 4140 and 4130 that resists sulfide stress corrosion and hydrogen embrittlement cracking. A105 and WCB are compatible with A234 WPB fittings, and ASTM A106/API5LB line pipe.

### Chemical Composition A105/WCB/WCC/LF2

| ELEMENT PROPERTIES     | ASTM A105           | ASTM A216       |            | ASTM A350           |
|------------------------|---------------------|-----------------|------------|---------------------|
|                        |                     | Gr. WCB         | Gr. WCC    | LF2                 |
| CARBON MAX             | 0.35                | 0.30            | 0.25       | 0.30                |
| MANGANESE              | 0.60 - 1.05         | 1.00 MAX        | 1.20 MAX   | 0.60 - 1.35         |
| PHOSPHORUS MAX         | 0.035               | 0.04            | 0.04       | 0.035               |
| SULFUR MAX             | 0.040               | 0.05            | 0.05       | 0.040               |
| SILICON                | 0.10 - 0.35         | 0.6 MAX         | 0.60 MAX   | 0.15 - 0.30         |
| NICKEL MAX             | 0.40 <sup>A</sup>   | 0.5             | 0.50       | 0.40 <sup>A</sup>   |
| CHROMIUM MAX           | 0.30 <sup>A,B</sup> | 0.5             | 0.50       | 0.30 <sup>A,B</sup> |
| MOLYBDENUM MAX         | 0.12 <sup>A,B</sup> | 0.2             | 0.20       | 0.12 <sup>A,B</sup> |
| COPPER MAX             | 0.40 <sup>A</sup>   | 0.3             | 0.30       | 0.40 <sup>A</sup>   |
| COLUMBIUM MAX          | 0.02                | -               | -          | 0.02 <sup>D</sup>   |
| VANADIUM MAX           | 0.08                | 0.03            | 0.03       | 0.05                |
| TENSILE STRENGTH PSI   | 70 000 MIN          | 70 000 - 95 000 | 70 000 MIN | 70 000 - 95 000     |
| YIELD STRENGTH PSI MIN | 36 000              | 36 000          | 40 000     | 36 000              |
| ELONGATION 2" % MIN    | 22                  | 22              | 22         | 22                  |
| REDUCTION AREA % MIN   | 30                  | 35              | 35         | 30                  |
| HARDNESS† (HB) MAX     | 187                 | 185             | 185        | 197                 |

The above table for A105 & LF2 is as per ASTM A350/A350M - 2012 for LF2 and A105/A105M-12.

† NACE MR-01-75 specifies 237 maximum brinell hardness. For LF2 refer ASTM A961/961M

<sup>A</sup> The sum of copper, nickel, chromium, molybdenum and vanadium shall not exceed 1.00%. <sup>B</sup> The sum of chromium and molybdenum shall not exceed 0.32%.

<sup>D</sup> By agreement, the limit for columbium may be increased up to 0.05% on heat analysis and 0.06% on product analysis.

### Carbon Steel Grades

| Material Group | Common Name | Material Type | UNS    | Forging Spec. | Casting ASTM Equivalent | DIN             | Din W No. | Application  |
|----------------|-------------|---------------|--------|---------------|-------------------------|-----------------|-----------|--|
| Carbon Steel   | CS          | C-Si          | K03504 | A105          | A216-WCB                | C22.8 DIN 17243 | 1.0460    | General non-corrosive service from -29°C (-20°F) to 425°C (800°F)  |
| Carbon Steel   | CS          | C-MN-Si       |        | A105N         | A216-WCC                |                 |           | General non-corrosive service from -29°C (-50°F) to 425°C (800°F). Slightly higher pressure ratings than WCB |



## CHROME MOLY/ALLOY/STEEL VALVES F11/F22/F5

Australian Pipeline Valve manufactures a large range of 'chrome-moly' valves. These valves are manufactured from low alloy steel containing chromium and molybdenum making them suitable for higher temperature service especially for higher pressure and temperature combinations. In addition, these valves have the added advantage of anti-corrosive properties. Grades include forged ASTM A182 F5, F5a, F9, F11 and F22, and their cast equivalents ASTM A217 C5, C12, WC5, WC6 and WC9. Higher grades like A112 F9/ASTM A217 C12A are available on an indent basis.

### Description

Chrome moly alloy is lightweight but strong, (similar to AISI 4130). With the additions of molybdenum and chromium, chrome moly alloy offers exceptional weldability along with oxidation and scaling resistance.

### Design Features

- Resistant to scaling and oxidation
- Harden through heat treatment
- Excellent weldability
- Strong and tough
- Excellent ductility

### Applications

- Pressure piping
- Pressure vessels
- Welded tubing applications

### Chemical Composition & Mechanical Properties ASTM A182†

| ELEMENT & PROPERTIES   | LOW ALLOY STEEL |              | MEDIUM ALLOY STEEL |              |
|------------------------|-----------------|--------------|--------------------|--------------|
|                        | F11 CL2         | F22 CL3      | F5                 | F9           |
| CARBON                 | 0.10 - 0.20     | 0.05 - .015  | 0.15 MAX           | 0.15 MAX     |
| MANGANESE              | 0.30 - 0.80     | 0.30 - 0.60  | 0.30 - 0.60        | 0.30 - 0.60  |
| PHOSPHORUS MAX         | 0.040           | 0.040        | 0.03               | 0.030        |
| SULFUR MAX             | 0.040           | 0.040        | 0.03               | 0.030        |
| SILICON                | 0.50 - 1.00     | 0.50 MAX     | 0.50 MAX           | 0.50 - 1.00  |
| NICKEL MAX             | -               | -            | 0.50               | -            |
| CHROMIUM               | 1.00 - 1.50     | 2.00 - 2.50  | 4.00 - 6.00        | 8.0 - 10.0   |
| MOLYBDENUM             | 0.44 - 0.65     | 0.87 - 1.13  | 0.44 - 0.65        | 0.90 - 1.10  |
| COPPER MAX             | -               | -            | -                  | -            |
| COLUMBIUM MAX          | -               | -            | -                  | -            |
| VANADIUM MAX           | -               | -            | -                  | -            |
| TENSILE STRENGTH PSI   | 70,000 (485)    | 75,000 (515) | 70,000 (485)       | 85,000 (585) |
| YIELD STRENGTH PSI MIN | 40,000 (275)    | 45,000 (310) | 40,000 (275)       | 55,000 (380) |
| ELONGATION 2" % MIN    | 20              | 20           | 20                 | 20           |
| REDUCTION AREA % MIN   | 30              | 30           | 35                 | 40           |
| HARDNESS (HB) MAX      | 143 ~ 207       | 156 ~ 207    | 143 ~ 217          | 179 ~ 217    |

† A182/A182M-13

\* NACE MR-01-75 specifies 237 maximum brinell hardness.

## Equivalent Grades & Applications

| Material Group  | Common Name                | Type             | UNS    | Forging Spec. | Casting Spec. Equivalent | DIN              | DIN W No. | Application                         |
|-----------------|----------------------------|------------------|--------|---------------|--------------------------|------------------|-----------|-------------------------------------|
| Low Alloy Steel | Moly Steel                 | C-1/2Mo          | K12822 | A182-F1 cl 1  | A217-WC1                 | 15M03            | 1.5415    | Up to 470°C (875°F)                 |
|                 | Alloy Steel<br>Chrome Moly | 1.1/4Cr-1/2Mo-Si | K11572 | A182-F11 cl 2 | A217-WC6                 | 13CRM044         | 1.7335    | Up to 593°C (1100°F)                |
|                 |                            | 2.1/4Cr-1Mo      | K21590 | A182-F22 cl 3 | A217-WC9                 | 10CRM0910        | 1.7380    | Up to 593°C (1100°F), HP steam      |
|                 |                            | 5Cr-1/2Mo        | K41545 | A182-F5a/F5   | A217-C5                  | 12CRM0195        | 1.7362    | High temp. refinery service         |
|                 |                            | 9Cr-1Mo          | K90941 | A182-F9       | A217-C12                 | X 12 CrMo 9 1    | 1.7386    | High temp. erosive refinery service |
|                 |                            | 9Cr-1Mo-V        |        | A182-F91      | A217-C12A                | X 10 CrMoVNb 9 1 | 1.4903    | High pressure steam                 |

## Applications

| FORGING SPECIFICATION | COMMON DESIGNATION                          | MATERIAL SUFFIX       | WROUGHT BAR SPECIFICATION | SERVICE RECOMMENDATIONS (1)   | COMMON API TRIM# FOR BASE MATERIAL |                |
|-----------------------|---|-----------------------|---------------------------|---|------------------------------------|----------------|
|                       |   |                       |                           |   | 150 TO 600#                        | 900 TO 2500#   |
| A182 F1               | C-1/2 Mo Low Alloy Steel                    | ASTM A217 Grade WC1   | A182 F1 Class 1           | Non-corrosive applications including water, oil and gases at temperatures between -24°C (-20°F) and +593°C (+1100°F)                            | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |
| A182 F2               | 0.75% Ni; Mo; 0.75% Cr Low Alloy Steel      | ASTM A217 Grade WC5   | A182 F2                   | Non-corrosive applications including water, oil and gases at temperatures WC5:- -29°C ~ 575°C, F2:- -29°C ~ 538°C. Not for prolonged use >470°C | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |
| A182 F11              | 1 1/4% Chrome; 1/2% Moly Low Alloy Steel    | ASTM A217 Grade WC6   | A182 F11 Class 2          | Non-corrosive applications including water, oil and gases at temperatures WC5:- -29°C ~ 575°C, F2:- -29°C ~ 538°C                               | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |
| A182 F22              | 2 1/4% Chrome Low Alloy Steel               | ASTM A217 Grade WC9   | A182 F22 Class 3          | Non-corrosive applications including water, oil and gases at temperatures between -30°C (-20°F) and +593°C (+1100°F)                            | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |
| A182 F5a/F5           | 5% Chrome; 1/2% Moly, Medium Alloy Steel    | ASTM A217 Grade C5    | A182 F5a/F5               | Mild corrosive or erosive applications as well as non-corrosive applications at temperatures between -30°C (-20°F) and +650°C (+1200°F)         | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |
| A182 F9               | 9% Chrome; 1% Moly, Medium Alloy Steel      | ASTM A217 Grade C12   | A182 F9                   | Mild corrosive or erosive applications as well as non-corrosive applications at temperatures between -30°C (-20°F) and +650°C (+1200°F)         | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |
| A182 F91              | 9% Chrome; 1% Moly; V-N, Medium Alloy Steel | ASTM A217 Grade C12-A | A182 F91                  | Mild corrosive or erosive applications as well as non-corrosive applications at temperatures between -30°C (-20°F) and +650°C (+1200°F)         | 8, 8A, 10, 12, 12A                 | 5, 5A, 12, 12A |



*For peace of mind, Australian Pipeline Valve have full in-house PMI facilities for Alloy grade verification.*

The information in this publication is a rough guide and should not be used for specifying the use of valves. Always consult latest relevant ASME and API publications.

*We can manufacture exotic grades like Nickel, Super Duplex F55 and Monel (ASTM A494-M35-1), Cd4M-Cu, Hastelloy C (ASTM A-494 CW12MW), 317 (C8G8M) in short lead-time.*

*For other ANSI, ASME, ISO, API, BS, API valve related technical cross reference charts and tables relating to standards, codes, pressure, temperature, application, suitability, equivalents, body & trim materials, valve manufacturing & test standards, etc., go to the Technical section of our website: <http://www.australianpipelinevalve.com.au>*

*We manufacture valves in API600, API602, API6D, BS1868, API603, API6A and numerous other standards including Ball, Butterfly, Check, Gate, Globe, Needle and Plug valves.*

# PRODUCTS MANUFACTURED BY AUSTRALIAN PIPELINE VALVE

## Gate Valves

- API 603 & 600 150# - 2500#
- API 602 & ANSI B16.34 800#, 1500#, 2500#, 2690#

## Globe Valves

- ANSI B16.34 & BS1873 150# - 2690#
- API 602 & BS5352 & ANSI B16.34 800#, 1500#, 2500#

## Check Valves

- ANSI B16.34
- API 602 & BS5352 & ANSI B16.34 800#, 1500#, 2500#, 2690#

## Ball Valves

- ANSI Class 150# - 2500#

## Multi-way Ball Valve

- 3 Way
- 4 Way

## Wafer Check Valves

- Dual & Single flap
- ANSI Class 150# - 2500#

## Strainers (Y) Pattern & Basket

- ANSI Class 150# - 2690#

## CROSS REFERENCE CHARTS & VALVE MATERIAL REFERENCES

For technical references and ASTM/ANSI 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: <http://www.australianpipelinevalve.com.au>

We can manufacture exotic grades like F55, Nickel, Super Duplex F55 and Monel (ASTM A494 M35-1) Cd4M-Cu, Hastelloy C (ASTM A-494 CW12MW), 317 (C8G8M) in short lead time.

*Major stockist and master distributors:- Global Supply Line Pty Ltd. Global Supply Line will provide a quotation or arrange for your Local Australian Pipeline Valve agent to contact you. You can also view catalogues and stocklists of Australian Pipeline Valves by going to the following website:- <http://www.australianpipelinevalve.com.au>*

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~ Short lead time valve manufacturer ~*

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