



GRUPO
CUNADO

STEAM

EQUIPMENT FOR STEAM AND
CONDENSATE LOOPS

VALVES | FILTERS | INSTRUMENTATION | PIPING AND FITTINGS

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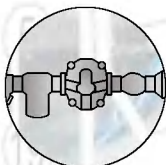
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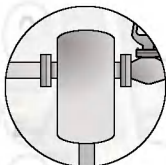
Introduction



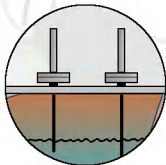
Valves



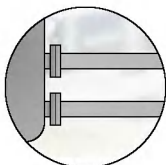
Steam traps



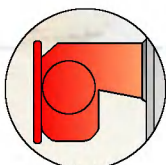
Filters & Separators



Instrumentation



**Pipes, Bends,
Fittings & Flanges**



Others

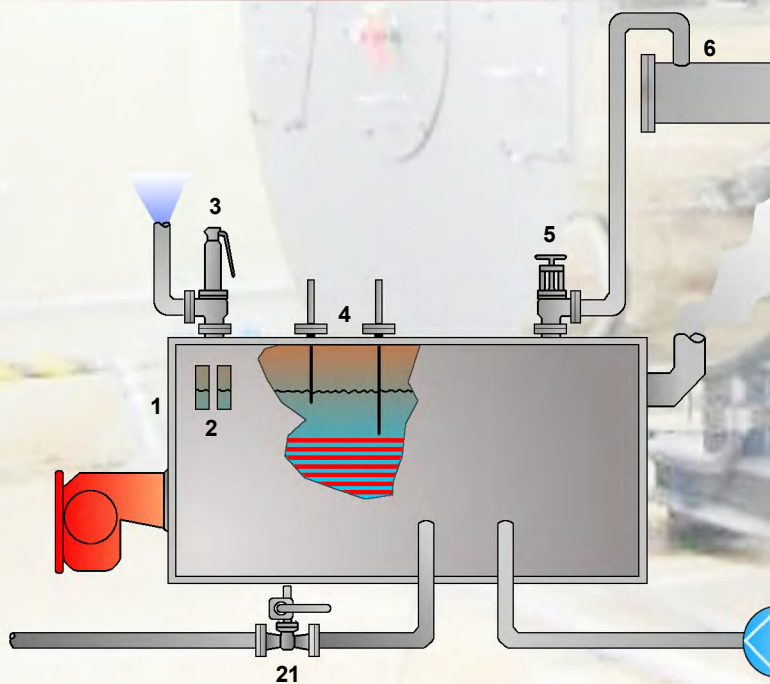


References

INTRODUCTION

If we are to name a fluid that combines multiple factors to be the ideal candidate for energy distribution most likely every one of us would think about steam. It is the vapour state of water, probably the most inexpensive and economical fluid used worldwide. Its high latent heat makes it an excellent heat transfer agent and due to its liquid-vapor equilibrium the change of pressure occurs at a constant temperature. Thermodynamics states that for isothermal expansions work is equal to the heat transferred. Power Plant engineers know it quite well as it is the universal fluid for power production. Steam is also clean and pure and widely used for sterilization purposes in several industries as pharma, food&beverage or health care. Among the industries that use steam as an important element of their manufacturing processes we could highlight:

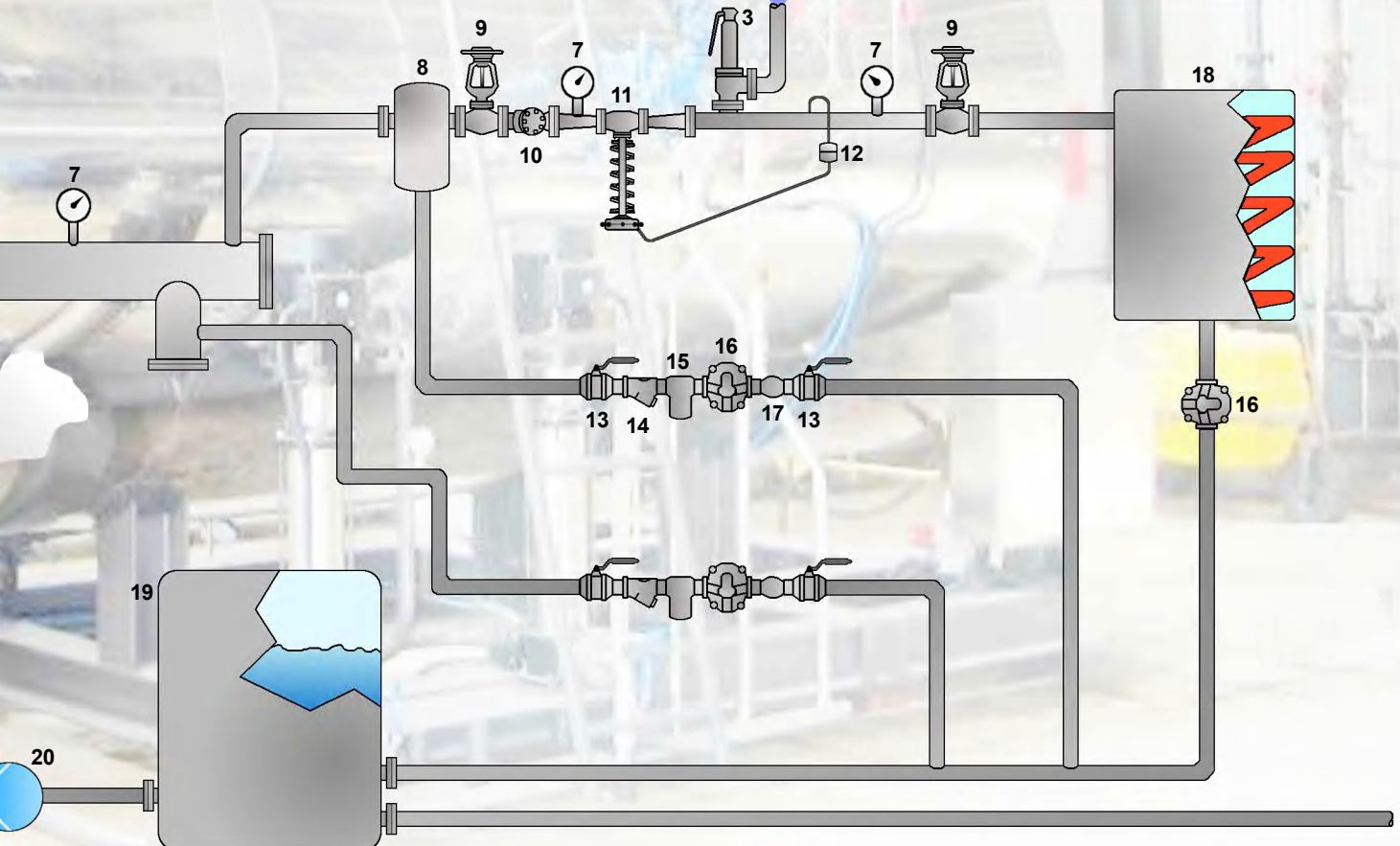
- Power Generation
- Pharma
- Shipbuilding
- Metal
- Chemicals & Plastics
- Pulp & Paper
- Oil Refining
- Food & Beverage
- Textile



THE STEAM LOOP

Steam generators need to be fed with treated (make-up) water so we are able to transform water into steam. Feedwater treatment becomes indispensable if foam and scale formation are to be avoided making the quality of this key element fundamental to the overall efficiency of the heart of the system, the steam generators. Instruments also play a key role on controlling crucial parameters such as water level, conductivity, flow, pressure or temperature. Once steam is generated it has to be distributed so it can be used. Valves are the most important players when it comes to distributing fluids. With the help of valves flow can be stopped, mixed, diverted and controlled. We can modify its pressure and therefore its temperature according the steam saturation curve. So, this way, pressure reducing valves are crucial if we want to take the most of our system. Condensation happens when steam releases its thermal energy and transforms to its liquid phase, water. In order collect the resulting condensate steam traps will open once liquid phase is detected. Condensate can be collected and mixed with make-up water in the feedwater tank so it can be reused again closing this way the loop.

- 1 Boiler
- 2 Sight Glasses
- 3 Safety Valve
- 4 Level Probes
- 5 Crown Valve (Globe)
- 6 Steam Header
- 7 Pressure Gauge
- 8 Separator
- 9 Isolation Valve (Globe)
- 10 Y-Type Steam Strainer
- 11 Pressure Reducing Valve
- 12 Seal Pot
- 13 Isolation Valve (Ball)
- 14 Y-Type Strainer
- 15 Leak Detector
- 16 Steam Trap (Float)
- 17 Check Valve
- 18 Load - Heat Exchanging
- 19 Feedwater Tank
- 20 Feedwater Pump
- 21 Blowdown Valve





VALVES

Different types of valves can be found in steam and condensate loops. Pressure Reducing are typical of these installations for regulating steam pressure means regulating its temperature (talking about saturated steam). Changes in different variables as temperature, humidity or pressure can actuate over control to properly regulate flow across them. Blowdown valves are important for boiler protection as they prevent escalation that could lead to even malfunction.

Type	Pressure Reducing
Materials	Carbon Steel, Stainless Steel, Alloy Steel, Bronze
Sizes	1/4" (DN8) - 2" (DN50)
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-1500#, DIN PN6-160)



Type	Control: Globe 2-way, 3-way (mixing, diverting)
Materials	Carbon Steel, Stainless Steel, Duplex/Superduplex, Nickel Alloy (Monel, Hastelloy...)
Sizes	1/2" (DN15) - 8" (DN200)
Connections	Flanged (ANSI 150-1500#, DIN PN6-40), clamp (sanitary)




Type	Blowdown: manual, automatic
Materials	Carbon Steel, Alloy Steel
Sizes	1/4" (DN8) - 2" (DN50)
Connections	Socket-Weld (SW), Flanged (ANSI 150-1500#, DIN PN6-320)




EQUIPMENT FOR STEAM AND CONDESANTE LOOPS


Safety valves will protect all the system from undesirable rise of pressure anytime as they are self-acting and autonomous. Check valves will ensure that no backflow will take place. On/Off valves are also widely used for isolating different parts of the loop.

Type	Safety/Relief - ASME I, ASME VIII, CE/PED - Spring Loaded, Pilot Operated Condensate Relief Valves, Vaccum Relief Valves	
Materials	Carbon Steel, Stainless Steel, Alloy Steel, Bronze, Brass	
Sizes	3/8" x 1/2" - 30" x 30"	
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-2500#, DIN PN6-160)	



Type	Check: disc, piston, swing	
Materials	Carbon Steel, Stainless Steel, Alloy Steel, Bronze, Brass	
Sizes	1/4" (DN8) - 30" (DN750)	
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-2500#, DIN PN6-160)	



Type	Isolation: Gate, Globe, Bellows-Sealed Globe, Ball, Butterfly	
Materials	Carbon Steel, Stainless Steel, Alloy Steel	
Sizes	From 1/4" (DN8)	
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-2500#, DIN PN6-160)	



STEAM TRAPS

Steam transforms into its liquid state by yielding its latent heat. Steam traps are valves that open when condensate is detected. Depending on the difference in the values of physical properties between water and steam that governs the opening of the steam traps these can be divided into three main groups: thermostatic (difference in temperature), mechanical (difference in density) and thermodynamic (difference in velocity).

Type	Thermostatic: Bimetallic, Balanced Pressure
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/4" (DN8) - 2" (DN50)
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-1500#, DIN PN6-160)



Type	Mechanical: Ball Float, Inverted Bucket
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/2" (DN12) - 4" (DN100)
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-900#, DIN PN6-160)



Type	Thermodynamic: optional strainer
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/4" (DN8) - 2" (DN50)
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-1500#, DIN PN6-160)

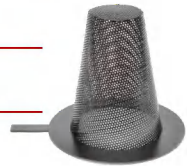


STRAINERS & SEPARATORS

Solid particles found in pipelines frequently cause critical damage. Strainers are able to capture these solids -mainly composed by scale, rust, weld metal or jointing compound- and prevent our system from suffering such harmful effects so we can also reduce maintenance and downtime. The steam produced in saturated steam boilers is essentially wet. Separators are devices which are able to get dry steam from the initially generated wet steam.

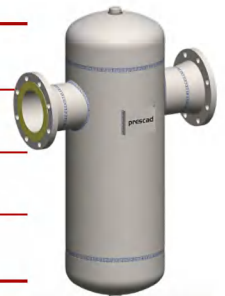
STRAINERS

Type	"Y", "T", basket (simplex & duplex), wafer, temporary (conical & troncoconical)
Materials	Housing: Cast Steel, Carbon Steel, Stainless Steel, Alloy Steel, Brass Screen: Stainless Steel, Duplex/Superduplex
Flow Rate	Any flow rate
Mesh	30 µm - 6 mm
Connections	Threaded (GAS, NPT), Socket-Weld (SW), Butt-Weld (BW), Flanged (ANSI 150-1500#, DIN PN6-160)



SEPARATORS

Type	Cyclone (centrifugal)
Materials	Carbon Steel, Stainless Steel
Sizes	DN15 - 500
Connections	Flanged PN16-160





INSTRUMENTATION

Continuous monitoring of parameters as temperature, level (tank, boilers), flow rate or pressure is critical for controlling the efficiency of the whole process. Instrumentation gives us the equipment necessary to get accurate values of those parameters. Instrumentation valves are used for distributing and isolating flow among different instruments.

Type	Level	
Features	Capacitive	32 bar, 238°C, IP65, GAS/NPT, 4-20 mA, TÜV verified, dual channel transmissor
	Conductive	32 bar, 238°C, IP65, GAS/NPT, SS316 electrodes, TÜV verified
	Magnetostrictive	10 bar, -20°C to 70°C, IP65, GAS/NPT, 4-20 mA, ±1mm accuracy, TÜV verified
	Ultrasonic	0.7-4 bar, -40°C to 80°C, IP67, GAS/NPT, 4-20 mA-HART, ±2 mm accuracy
	Radar	-1-16 bar, -40°C to 150°C, IP66, GAS/NPT/Flanged, 0.1% accuracy 4-20 mA/HART/MODBUS, TÜV verified
	Float-Buoy	16 bar, -60°C to 200°C, GAS/NPT/Flanged, SS buoy with optional plastic coating or polishing, buoy Ø = 3/8"-3"
	Sight-Glasses	GAS/NPT/SW/Flanged, Carbon/Stainless Steel, 1 or 2 windows, flow indicator



Type	Pressure	
Features	Gauges	0-0.6 bar // 0-1600 bar, 200°C, IP65, accuracy according EN13190 Ø = 63, 100, 160 mm, optional switches and 4-20 mA output
	Transmitters	0-80 MPa, -40°C to 120°C, IP 66/67, ±0,075% accuracy, ±0,125% repeatability 316SS/316SS or Al body/housing, 4-20 mA/HART/pulses output



EQUIPMENT FOR STEAM AND CONDESANTE LOOPS

Type	Flow Rate	
Features	Vortex	0-100 bar, -40°C to 240°C, ±0.75% accuracy, ±0.1% repeatability, IP66/67 Flanged, 316SS/Hastelloy body, Al housing, 4-20 mA/HART/Pulses/NAMUR
	Electromagnetic	10 L/h-1400 m³/h, ±0.5% accuracy, min. conductivity 20 µS, IP67, Flanged/Wafer DN10-1000, 304SS body, Hastelloy electrodes, special coatings (PTFE, ebonite...) 4-20mA/HART/MODBUS, programmable relays
	Ultrasonic	Non-instrusive clamp-on type, 0.2-12 m/s, ±0.75% accuracy, ±0.1% repeatability IP65, suitable for DN80-2000 pipes, 4-20 mA, programmable relays
	Orifice Plate	316/304/318SS, wide range of sizes, calculations acc. ISO 5167-1, flanged optional



Type	Temperature	
Features	Thermometers	0 to 500°C, 25 bar, IP65, accuracy according EN13190, 316SS 1000 mm max. immersion, optional switches and 4-20 mA output
	Transmitters	Thermowell: 316SS drilled bar stock/welded, Thermocouple: Pt-100, -200°C to 850°C, smart/analogical types/HART, SIL



Type	Valves	
Features	Manifolds	Gauge valves, Block&Bleed 2-way, 3-way, 5-way
	Needle	316/304SS, NPT/OD connections, to regulate flow and to avoid waterhammer





PIPES, BENDS, FITTINGS AND FLANGES

Since its very beginning in 1963 CUÑADO GROUP has been distributing piping, fittings and accessories. We are also distributing special piping products for the steam industry as bendings and alloy steels seamless and welded pipes.



Type	Pipes: Seamless & Welded
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/4" (DN8) - 48" (DN1200)
Rating/Pressure	SCH (ASME Code), Thickness (EN code)

Type	Bends: Seamless & Welded
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/4" (DN8) - 48" (DN1200)
Rating/Pressure	SCH (ASME Code), Thickness (EN code)

Type	Fittings: BW (Seamless & Welded), Forged
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/4" (DN8) - 48" (DN1200)
Rating/Pressure	SCH (ASME Code), Thickness (EN code)

Type	Flanges: WN, BL, SO, LP, SW, NPT and others
Materials	Carbon Steel, Stainless Steel, Alloy Steel
Sizes	1/4" (DN8) - 48" (DN1200)
Rating/Pressure	According ANSI & EN

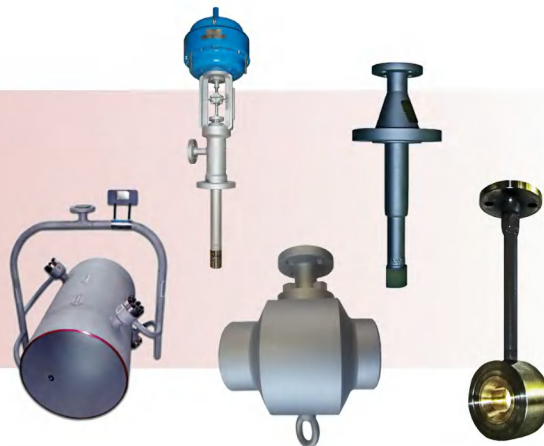
OTHERS

As a customer-focused company CUNADO GROUP is able to provide integral supply solutions anywhere to our customers as an added value to our services chain. Some other products that we typically offer for steam and condensate loops applications are desuperheaters, heat-exchangers, special high performance valves and building structures.

DESUPERHEATERS

Special devices for the steam temperature control and reduction thanks to the injection of perfectly atomized water.

- Fixed a variable area nozzles
- Available in different sizes and ratings
- Body materials: carbon, stainless and alloy steels
- Trim materials: hardened stainless steels

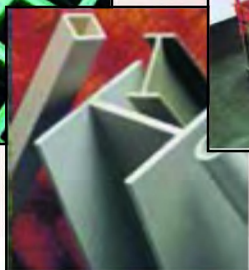
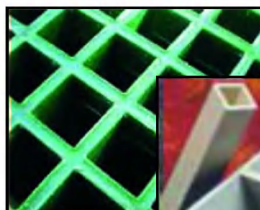
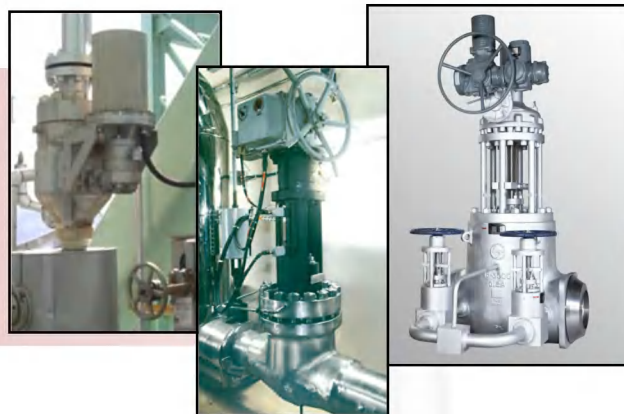


HEAT EXCHANGERS

Gasketed plate-and-frame heat exchangers provide efficient heat transfer in compact equipment with a small footprint. The product range is extremely wide and is used in duties for heating, cooling, heat recovery, evaporation and condensation in industries ranging from HVAC, refrigeration, engine cooling, dairy and food to heavier processes like chemical processing, oil production and power generation.

HIGH PERFORMANCE VALVES

Power Generation often requires of valves able to withstand strong demanding process conditions combining high pressures, temperatures and flow rates. Examples of these kind of valves are pressure seal forged valves, actuator-assisted safety valves or turbine bypass valves.



STRUCTURES

For building of floors, platforms, footbridges, ramps, ladders...

- Grating modular structures (open/close surface grating)
- Profiles (IPN/HEB, UPN, ANGLE)
- Plates
- Square and tubular pipes
- Handrails, ladders, caps and accessories



REFERENCES



CHEMICAL

BASF, Dow Chemical
Ercros, Grupo Samca, Solvay
Viscofan, Grupo Novartis, Ube
Unión Deriván, Bioibérica, Purac
Linde AG, BP, Fertiberia
Industrias Químicas del Ebro

PHARMA

B. Braun, Bayer, Boehringer
Esteve Química, Glaxo SK
Pharmaplan, Fresenius
Merck, Lilly Pharma, Sandoz
Almirall Prodesfarma

FOODS

BdF, Kellogg's, Danone
Nestlé, Cargill Foods, Cadbury
Unilever, Milkana, Bühler
Casa Tarradellas, Tereos Syral



DRINKS

Coca Cola, Grupo Damm
Orangina, Pepsi, Perrier
San Miguel, Mahou,
Pascual, Carlsberg
Heineken, García Carrión

PAPER&MILL

Kimberly Clark, Smurfit Kappa
Sarrió, Miguel i Costas
Europac, Celesa, Faber-Castell
ENCE, Mondi Paper
Torras Paper, Saica



TEXTILE

Benetton, Betty Barclay,
BOSS, Goretex, Lummus,
YKK, Borgstena

POWER

GDF Suez, E.ON Español
berdrola, Abengoa Solar
Gas Natural Fenosa
Babcock, EDP Energía

OIL&GAS

Enagas, Esso
Eni Agip, Repsol
Gas Natural, Petronor
Repsol, BP, Cepsa
Shell, Texaco



ENGINEERING

Técnicas Reunidas , Duro Felguera
Initec Energía, Foster Wheeler
Cobra, Abengoa, Sener
Technip-FMC, Grupo Suez, IDOM,
Navantia

AUTOMOTIVE

BMW, Dacia Renault,
Mercedes, Nissan, Opel,
Peugeot, Goodyear,
SEAT, Volkswagen, Ford
Michelin, Pirelli





TYPICAL MATERIALS EQUIVALENCE CHART

Material	Forgings	Castings	Pipe	UNS	DIN W.
Carbon Steel Standard Service	A105/A105N/A106	A216-WCB/WCC	A106-Gr.B/API5LB	K03504	1.0460
Low-Temp Service	A350-LF2	A352-LCB/LCC	A333-Gr.6	K03011	1.0566
Low Temperature Nickel Steel (3.1/2Ni)	A350-LF3	A352-LC3	A333-Gr.3	K32025	1.5637
Low Alloy Steel					
C-1/2Mo (Moly Steel)	A182-F1	A217-WC1	A335-P1	K12822	1.5414
1-1/4Cr-1/2Mo	A182-F11 CL2	A217-WC6	A335-P11	K11572	1.7335
2-1/4Cr-1/2Mo	A182-F22 CL3	A217-WC9	A335-P22	K21590	1.7380
5Cr-1/2Mo	A182-F5a	A217-C5	A335-P5	K41545	1.7362
9Cr-1Mo	A182-F9	A217-C12	A335-P9	K90941	1.7386
9Cr-1Mo-V	A182-F91	A217-C12A	A335-P91		1.4903
Stainless Steel 410 (13Cr)	A182-F6	A351-CA15	A268-TP410	S41000	1.4006
Stainless Steel 304 (18Cr-8Ni)					
Standard	A182-F304	A351-CF8	A312-TP304	S30400	1.4301
Low Carbon	A182-F304L	A351-CF3	A312-TP304L	S30403	1.4306
High-Temp Service	A182-F304H	A351-CF10	A312-TP304H	S30409	
Stainless Steel 310 (25Cr-20Ni)	A182-F310H	A351-CK20	A312-TP310	S31000	1.4845
Stainless Steel 316 (16Cr-12Ni-2Mo)					
Standard	A182-F316	A351-CF8M	A312-TP316	S31600	1.4401
Low Carbon	A182-F316L	A351-CF3M	A312-TP316L	S31603	1.4404
High-Temp Service	A182-F316H	A351-CF10M	A312-TP316H	S31609	
Stainless Steel 317 (18Cr-13Ni-3Mo)					
Standard	A182-F317	A351-CG8M	A312-TP317	S31700	
High-Temp Service	A182-F317H	A351-CF8A		S31709	
Stainless Steel 321 (18Cr-10Ni-Ti)					
Standard	A182-F321		A312-TP321	S32100	1.4541
High-Temp Service	A182-F321H		A312-TP321H	S32109	
Stainless Steel 347 (18Cr-10Ni-Cb)					
Standard	A182-F347	A351-CF8C	A312-TP347	S34700	1.4550
High-Temp Service	A182-F347H		A312-TP347H	S34709	
Alloy 20 Steel (28Ni-19Cr-Cu-Mo)	A182-F20	A351-CN7M	B729-N08020	N08020	2.4660
Super Austenitic (20Cr-18Ni-6Mo)	A182-F44	A351-CK3MCuN	A312-S31254	S31254	1.4547
Duplex Stainless Steel					
22Cr-5Ni-3Mo-N	A182-F51	A351-CD3MN	A790-S31803	S31803	1.4462
24Cr-10Ni-Mo-N		A351-CE8MN		J93345	
Super Duplex Stainless Steel					
25Cr-7Ni-4Mo-N	A182-F53	A995-CE3MN	A790-S32750	S32750	1.4410
25Cr-7Ni-3.5Mo-N-Cu-W	A182-F55	A995-CD3MWCuN	A790-S32760	S32760	1.4501
High Nickel & Ni Based Alloys					
Incoloy 800	B564-N08800		B163-N08800	N08800	1.4876
Incoloy 825	B564-N08825	A494-CU5MCuC	B163-N08825	N08825	2.4858
Nickel 99/95Ni	B160-N02200	A494-CZ-100	B161-N02200	N02200	1.7740
Monel 400	B564-N04400	A494-M35-1	B163-N04400	N04400	2.4360
Monel 500	B564-N05500		B163-N05500	N05500	2.4375
904L	904L		A312-TP940L	N08904	1.4539
Inconel 600	B564-N06600	A494-CY40	B163-N06600	N06600	2.4816
Inconel 625	B564-N06625	A494-CW-6MC	B444-N06625	N06625	2.4856
Hastelloy C-276	B564-N10276	A494-CW-2M	B622-N10276	N10276	2.4819
Titanium (98Ti)	B381-Gr2	B367-C2	B861-Gr.2	R50400	3.7035

EQUIPMENT FOR STEAM AND CONDESANTE LOOPS

API600 VALVES TRIM CHART

Trim	Nominal Trim	Seat Surface (HB) Min. (a)	Seat Surface Material Type (b)	Seat Surface Typical Specifications Grade			Stem/Bushing		Stem Hardness (HB)	Backseat Bushing Hardness (HB)
				Cast	Forged	Welded (m)	Material Type (b)	Typical Spec. Type		
1	F6	TRIM NUMBER 1 IS OBSOLETE								
2	304	TRIM NUMBER 2 IS OBSOLETE								
3	F310	Note (d)	25Cr-20Ni	NA	A182-F310	A5.9 ER310	25Cr-20Ni	A276-T310	Note (d)	Note (d)
4	Hard F6	750 (e)	Hard 13Cr	NA	Note (f)	NA	13Cr	A276-T410/420	200-275	250 min
5	Hardfaced	350 (e)	Co-Cr A (g)	NA	NA	A5.13 ECoCr-A A5.21 ECoCr-A	13Cr	A276-T410/420	200-275	250 min
5A	Hardfaced	350 (e)	Ni-Cr	NA	NA	Note (h)	13Cr	A276-T410/420	200-275	250 min
6	F6 and Cu-Ni	250 (i)	13Cr	A217-CA15	A182-F6a	A5.9 ER410	13Cr	A276-T410/420	200-275	250 min
		175 (i)	Cu-Ni	NA	Note (k)	NA				
7	F6 and Hard F6	250 (i)	13Cr	A217-CA15	A182-F6a	A5.9 ER410	13Cr	A276-T410/420	200-275	250 min
		750 (i)	Hard 13Cr	NA	Note (f)	NA				
8	F6 and Hardfaced	250 (i)	13Cr	A217-CA15	A182-F6a	A5.9 ER410	13Cr	A276-T410/420	200-275	250 min
		350 (i)	CoCr-A (g)	NA	NA	See Trim 5				
8A	F6 and Hardfaced	250 (i)	13Cr	A217-CA15	A182-F6a	A5.9 ER410	13Cr	A276-T410/420	200-275	250 min
		350 (i)	Ni-Cr	NA	NA	Note (h)				
9	Monel	Note (d)	Ni-Cu Alloy	NA	MFG Standard	NA	Ni-Cu Alloy	MFG Standard	Note (d)	Note (d)
10	316	Note (d)	18Cr-8Ni	A351-CF8M	A182-F316	A5.9 ER316	18Cr-8Ni-Mo	A276-T316	Note (d)	Note (d)
11	Monel and Hardfaced	Note (d)	Ni-Cu Alloy	NA	MFG Standard	NA	Ni-Cu Alloy	MFG Standard	Note (d)	Note (d)
		350 (i)	Trim 5 or 5A	NA	NA	See Trim 5 or 5A				
12	316 and Hardfaced	Note (d)	18Cr-8Ni-Mo	A351-CF8M	A182-F316	A5.9 ER316	18Cr-8Ni-Mo	A276-T316	Note (d)	Note (d)
		350 (i)	Trim 5 or 5A	NA	MFG Standard	See Trim 5 or 5A				
13	Alloy 20	Note (d)	19Cr-29Ni	A351-CN7M	B473	A5.9 ER320	19Cr-29Ni	B473	Note (d)	Note (d)
14	Alloy 20 and Hardfaced	Note (d)	19Cr-29Ni	A351-CN7M	B473	A5.9 ER320	19Cr-29Ni	B473	Note (d)	Note (d)
		350 (i)	Trim 5 or 5A	NA	NA	See Trim 5 or 5A				
15	Hardfaced	350 (e)	CoCr-A (g)	NA	NA	See Trim 5	18Cr-8Ni	A276-T304	Note (d)	Note (n)
16	Hardfaced	350 (e)	CoCr-A (g)	NA	NA	See Trim 5	18Cr-8Ni-Mo	A276-T316	Note (d)	Note (n)
17	Hardfaced	350 (e)	CoCr-A (g)	NA	NA	See Trim 5	18Cr-10Ni-Cb	A276-T347	Note (d)	Note (n)
18	Hardfaced	350 (e)	CoCr-A (g)	NA	NA	See Trim 5	19Cr-29Ni	B473	Note (d)	Note (n)
19	Nickel	Note (d)	Ni Alloy	MFG Standard	MFG Standard	MFG Standard	Ni Alloy	MFG Standard	Note (d)	Note (n)
19A	Alloy 625	Note (d)	Alloy 625	A494-CW6MC	B564-N06625	A5.14 ERNiCrMo-3	Alloy 625	B564-N06625	Note (d)	Note (n)
19B	Alloy C276	Note (d)	Alloy C276	A494-CW2M	B564-N10276	A5.14 ERNiCrMo-4	Alloy C276	B564-N10276	Note (d)	Note (n)
19C	Alloy 825	Note (d)	Alloy 825	A494-CU5MCuC	N564-N08825	A5.14 ERNiCrMo-3	Alloy 825	N564-N08825	Note (d)	Note (n)
20	Nickel and Hardfaced	Note (d)	Ni Alloy	MFG Standard	MFG Standard		Ni Alloy	MFG Standard	Note (d)	Note (n)
		350 (i)	CoCr-A (g)	NA	NA	See Trim 5				
20A	Alloy 625 and Hardfaced	Note (d)	Alloy 625	A494-CW6MC	B564-N06625	A5.14 ERNiCrMo-3	Alloy 625	B564-N06625	Note (d)	Note (n)
		350 (i)	CoCr-A (g)	NA	NA	See Trim 5				
20B	Alloy C276 and Hardfaced	Note (d)	Alloy C276	A494-CW2M	B564-N10276	A5.14 ERNiCrMo-4	Alloy C276	B564-N10276	Note (d)	Note (n)
		350 (i)	CoCr-A (g)	NA	NA	See Trim 5				
20C	Alloy 825 and Hardfaced	Note (d)	Alloy 825	A494-CU5MCuC	N564-N08825	A5.14 ERNiCrMo-3	Alloy 825	N564-N08825	Note (d)	Note (n)
		350 (i)	CoCr-A (g)	NA	NA	See Trim 5				
21	Hardfaced	350 (e)	CoCr-A (g)	NA	NA	See Trim 5	Ni Alloy	MFG Standard	Note (d)	Note (n)

(a) HB (formerly BHN) is the symbol for the Brinell hardness per ASTM E10. (b) Free machining grades of 13Cr are prohibited. (c) Body and disc surfaces should be 250 HB. (d) Manufacturer's standard hardness. (e) Differential hardness between the body and disc seat surfaces is not required. (f) Case hardness by nitriding to a thickness of 0.13 mm (0.005") minimum. (g) AWS A5.13 ECoCr-A or AWS A5.21 ECoCr-A: This classification includes such trademark materials as Stellite 6, Stoddy 6 and Wallex 6. For Plasma Transfer Arc Welding (PTAW) process powder with the metallurgy equivalent 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 ERCr-E. (h) Manufacturer's standard hardfacing with a maximum iron content of 25%. (i) Hardness differential between the body and disc seat surfaces shall be the manufacturer's standard. (j) Not used. (k) Manufacturer's standard with 30 Ni minimum. (l) Not used. (m) Typical backseat weld deposit material. (n) Per manufacturer's standard if not hardfaced, 250 HB minimum if hardfaced.



Calle Camino del Olivar, 2 (Esquina Calle México)
28806 Alcalá de Henares, Madrid (SPAIN)
Tel.: (+34) 91 887 87 00 - Fax: (+34) 91 887 87 33
info@grupocunado.com

www.grupocunado.com

SPAIN

ANDALUCÍA: SEVILLA, HUELVA & ALGECIRAS (+34) 955.63.06.12 - andalucia@cunado.com
ARAGÓN: ZARAGOZA (+34) 976.18.52.58 - aragon@cunado.com
CANARIAS: LAS PALMAS & TENERIFE (+34) 928.70.05.00 - canarias@cunado.com
CASTILLA LA MANCHA: PUERTOLLANO (+34) 926.46.00.55 - clm@cunado.com
CASTILLA Y LEÓN: VALLADOLID (+34) 983.52.86.00 - ventascastillaleon@cunado.com
CATALUÑA: BARCELONA, GERONA & TARRAGONA (+34) 93.575.24.24 - cataluna@cunado.com
GALICIA: VIGO (+34) 986.34.26.06 - galicia@cunado.com
LEVANTE: VALENCIA & CARTAGENA (+34) 96.181.92.00 - levante@cunado.com
MADRID: (+34) 91.887.87.00 - madrid@cunado.com
NORTH: BILBAO & GIJÓN (+34) 94.453.31.54 - norte@cunado.com

INTERNATIONAL

CTA, LDA. (PORTUGAL): (+351) 217.995.280 - info@cta.pt
CUINTER (CHILE): (+56) 2.2787.0300 - mail@cunado.cl
CUÑADO ASIA CORPORATION (CHINA): (+86) 21.2024.8130 - info@cunadoasia.com
CUÑADO BOLIVIA: (+591) 3.3110683 - bolivia@grupocunado.com
CUÑADO BORU (TURKEY): (+90) 262.37.37.014 - info.turquia@grupocunado.com
CUÑADO CANADA: info.canada@grupocunado.com
CUÑADO COLOMBIA: (+51) 320.532.2498 - info.colombia@grupocunado.com
CUÑADO DUBAI (UAE): info.dubai@grupocunado.com
CUÑADO MEXICO: (+52) 55.5254.04.05 - cumex@prodigy.net.mx
CUPERSA (PERU): (+51) 141.662.00 - info@cupersa.pe
CUVENSА (VENEZUELA): (+58) 241.871.75.06 - finanzas@cuvensa.com
FLABOFORM GMBH (GERMANY): (+49) 7254 9271 0 - info@flaboform.de
ITF, INC. (USA): (+1) 713.952.4111 - itfinc@cunadousa.com
OMEGA INDUSTRIAL (USA): (+1) 225.749.9808 - info@omega-industrial.com
RAGENSА (PERU): (+51) 141.662.00 - info@cupersa.pe

