



MM0002 Piping standards – Appendix 1

Flow Substances, Selection of Pipe Classes and Valves

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1 General

This document presents flow substances used in the project, their codes, for flow substances selected piping materials, valve types and body, closing device and seat materials.

2 Flow Substance

Flow substances are divided into following main categories:

- Airs
- Additives
- Condensates
- Chemicals
- Effluents
- Feed Waters
- Gases
- Liquors
- Oils and Fuels
- Pulps
- Solids
- Steams
- Waters

3 Piping Material Abbreviations

C1	P235GH	EN 10216-2 - seamless
C1	P235GH	EN 10217-2 - welded
C1	P235GH	EN 10217-5 - welded
C2	16Mo3 (1.5415)	EN 10216-2 – seamless
C3	13CrMo4-5 (1.7335)	EN 10216-2 – seamless
C4	10CrMo9-10 (1.7380)	EN 10216-2 - seamless
C5	X10CrMoVNb9-1 (1.4903)	EN 10216-2 - seamless
H1	1.4307 (X2CrNi 18-9)	EN 10217-7 - Austenitic stainless CrNi-steel
H2	1.4432 (X2CrNiMo 17-12-2)	EN 10217-7 - Austenitic stainless CrNiMo-steel
H3	1.4462 (X2CrNiMoN 22-5-3)	EN 10217-7 - Duplex 2205
H4	1.4539	EN 10217-7 - 904L
H5	1.4547(X1CrNiMoCuN 20-18-7)	EN 10217-7 - 254 SMO
K1	ASTM B619 Grade C 276	ASME SB 619 - Hastelloy C
K2	ASTM B337 Grade 2	ASME SB 862 - Gr. 2 Titanium
L1	PEH	EN ISO 15494 - Polyethen
L3A	PP	EN ISO 15494 - Polypropylen
L3B	PP/FRP	EN ISO 15494 – PP with laminated FRP
L4A	PVC-U	EN ISO 15493 (PVC unplasticized)
L4B	PVC-C	EN ISO 15493 (PVC chlorinated)
L4C	PVC-C/FRP	EN ISO 15493
L6A	PVDF/FRP	EN ISO 10931
L6B	PVDF/steel	

M1	Concrete
S2A	Vinyl ester based FRP (VE)
S2B	Vinyl ester based FRP with thick inner protection layer

4 Valve Material Abbreviations

CI	Cast iron
CS	Carbon steel (cast or forged)
D2205	Duplex 2205
D2507	Superduplex 2507
NI	Nodular iron
SA	Alloy steel (CrMo or 16Mo3 type)
SS	Austenitic stainless CrNi-steel (304/304L)
SS316	Austenitic stainless CrNiMo-steel (316/316L)
SS317	Type 317 Stainless steel
HCHR	Hard chrome plated
STELL	Stellite
INC	Inconel
MO	Monel
AL	Aluminum
BR	Bronze
TI	Titanium
GL	Glass
CER	Ceramic
CR	Chloroprene rubber (e.g. Neoprene)
CSM	Chlorosulphonated polyethylene (e.g. Hypalon)
EPR	Ethene-propene rubber
EPDM	Ethene-propene terpolymer rubber
FPM	Fluorinated rubber (e.g. Viton)
FRP	Reinforced plastic
NBR	Nitrile-butadiene rubber
NR	Natural rubber
PE	Polyethene
PEEK	Polyetheretherketone
PEH	HD polyethene
PEL	LD polyethene
PFA	Perfluoroalkoxy polymer
PP	Polypropene
PTFE fiber	Polytetrafluoroethene (e.g. Teflon) in gaskets with carbon reinforcement
PVC	Polyvinyl chloride
PVDC	Polyvinylidenechloride (e.g. Saran)
PVDF	Polyvinylidene fluoride (e.g. Kynar)

RPTFE	Reinforced PTFE
UPVC	Hard PVC

5 Flange Gaskets

Type AA

Fibre gasket e.g. Klingsil C- 4500

Type AT

PTFE Polytetrafluoroethene, reinforced

E.g. Klinger Top-Chem 2000, Gore S800, Sigma 511

Note: General purpose; water, stock, chemicals

Static loads, $T < 150\text{ }^{\circ}\text{C}$, $P < 30\text{ bar}$. Silicon dioxide reinforced gaskets are not allowed.

Type GF

Graphite packing (98 % pure graphite) chloride content less than 50 ppm.

E.g. Burgmann 9593/HD, Klinger Grafit PSM 200, Sigraflex V20010C21, Grafilite SP

Note: For steams

Type AB

Spiral packing e.g. Klinger spiral wound gasket/Maxiflex, James Walker Metaflex type SG/IR, Burgmann 9594 Spiraltherm, TT Gasket Spiral

Note: dynamic loads

6 Valve selection

6.1 Abbreviations and codes for valve types

Abbreviation	Valve type
BAL	Ball valves
BUT	Butterfly valves
GLO	Globe valves
GAT	Gate valves
SLI	Knife gate valves ("Slide valves")
DIA	Diaphragm valves
PLU	Plug valves
NEE	Needle valves
PIS	Piston valves
CHS	Swing check valves
CHB	Ball check valves
CHD	Disc check valves
CHG	Globe check valves
SAF	Safety relief valves
VAV	Vacuum valves
STR	Steam traps

STRA	Strainers
ATR	Air traps
MISC	Others

6.2 Valve connection types

FL	Flanges
BF	Between flanges
WE	Welding ends
TH	Threaded ends
WE+TH	Welding end + thread end

6.3 Valve function codes

CH	Check
PS	Pump suction side valve
SO	Shut-off
EQ	Equipment connection

6.4 General instructions for selection of valves

The valves shall be CE marked to the extent required by the Pressure Equipment Directive (PED) 2014/68/EU classification.

Valve types shall be tested in use and found well-trying reliable types.

Actuator for ball and butterfly valves shall be selected as follows:

- Manual lever DN < 150
- Gear DN > 150

Dependent on the process conditions, may gear also be required for smaller dimensions. Valves shall be provided with extended spindles, if insulation or placement reasons so require.

Valves on suction pipelines to the pumps shall be of full bore type, such as ball valve, knife gate valve, etc.

Ball valves DN < 100 shall be delivered with long weld ends if not otherwise agreed.

Valves are not allowed to be welded to each other without piece of pipe in between them.

The flow port of ball valves with core ball shall be tubed for media that cause plugging, also for high consistency stock > 10 %.

For stock > 3.0 % valve types with a full port shall be used.

In stock lines butterfly valves between flanges shall be equipped with metal seals and with a cutting closing movement of the disc.

One-part welded ball valves DN < 100 with reduced bore may only be used for media with low viscosity and without impurities or abrasive particles.

The leakage rates of the valves are based on the standard EN 12266-1. The leakage rates shall be A for soft seated valves and B for hard seated valves if not otherwise specified.

Main shut-off valves shall be equipped with locking device.



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve									
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks
									Body	Disc	Spin	Seat			
AIRS	Instrument air (dried below < -20 °C)	5...7	15/60	H1	AA	15-50	CHD	BF	SS	SS	SS	SS	A	CH	3) Weld ends shall be used primarily. Valves with flanges shall be selected if maintenance or other reasons so require
						65-150	CHS	BF	SS	SS	SS	SS			
						10-100	BAL	WE	SS	SS	SS	PTFE			
						10-100	BAL	FL ³⁾	SS	SS	SS	PTFE			
						125-200	BUT	BF	SS	SS	SS	EPDM			
AIRS	Compressed air	60/70	15/60	H1	AA	15-50	CHD	BF	SS	SS	SS	SS	A	CH	3) Weld ends shall be used primarily. Valves with flanges shall be selected if maintenance or other reasons so require
						65-150	CHS	BF	SS	SS	SS	SS			
						10-100	BAL	WE	SS	SS	SS	PTFE			
						10-100	BAL	FL ³⁾	SS	SS	SS	PTFE			
						125-200	BUT	BF	SS	SS	SS	EPDM			
AIRS	Exhaust air / vents	Material to be checked case by case (according to main pipe/tanks)													
AIRS	Vacuum	-0.05/-1	15/60	H1/H2	AA	15-50	CHD	BF	SS / SS316	SS / SS316	SS / SS316	SS / SS316	A	CH	Valve material according to pipe class material group
						65-400	CHS	BF	SS / SS316	SS / SS316	SS / SS316	SS / SS316			
						15-100	BAL	WE	SS / SS316	SS / SS316	SS / SS316	PTFE			
						10-100	BAL	FL ³⁾	SS / SS316	SS / SS316	SS / SS316	PTFE			
						125-400	BUT	BF	SS / SS316	SS / SS316	SS / SS316	EPDM			
ADDITIVES	Biocide aids		25			20-100	CHB	FL	N/PTFE	N/PTFE		PTFE	A	CH	Depends on chemicals
						10-100	BAL	FL	N/PTFE	N/PTFE		PTFE			
ADDITIVES	Bentonite		25/60	H2	AT	10-50	CHD	BF	SS316	SS316		SS316	B	CH	
						65-100	CHS	BF	SS316	SS316		SS316			
						10-100	BAL	WE	SS316	SS316/HCHR	SS316	STELL			



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Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.					Leakage rate	Function	Remarks		
									Material								
									Body	Disc	Spin	Seat					
ADDITIVES	Flocculent	3/8	25/50	S2A L4C	AT	20-100 20-100	CHB BAL	FL FL	N/PTFE NI/FEB	N/PTFE NI/FEB	SS SS	SS PTFE	A	CH SO			
ADDITIVES	Defoamer	0.5/1	25/60	H2	AT	10-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO			
CONDENSATES	Condensate 6 bar(g)	3.5 5.3	150/ 200	C1	GF	15-50	CHG	FL	CS	SS		SS		CH			
						65-400	CHS	BF	CS	SS		SS		CH			
						15-65	GLO	WE	CS	SS	SS	STELL	B	SO			
						80-400	GAT	WE	CS	SS	SS	STELL	B	SO			
CONDENSATES	Condensate 16 bar(g)	11/17	190/250	C1	GF	15-50	CHG	FL	CS	SS		STELL		CH			
						65-600	CHS	BF	CS	SS		STELL		CH			
						15-65	GLO	WE	CS	SS	SS	STELL	B	SO			
						80-600	GAT	WE	CS	SS	SS	STELL	B	SO			
CONDENSATES	Condensate 25 bar(g)	24/40	222/460	C2	GF	15-50	CHG	WE	SA	SS		STELL		CH			
						65-300	CHS	WE	SA	SS		STELL		CH			
						15-65	GLO	WE	SA	SS	SS	STELL	B	SO			
						80-300	GAT	WE	SA	SS	SS	STELL	B	SO			
CONDENSATES	Condensate 110 bar(g)	94/110	300/500	C3/C4	AB	15-50	CHG	WE	SA	SS		STELL		CH			
						65-700	CHS	WE	SA	SS		STELL		CH			
						15-65	GLO	WE	SA	SS	SS	STELL	B	SO			
						80-700	GAT	WE	SA	SS	SS	STELL	B	SO			
CONDENSATES	Clean condensate, Stripped condensate	6 7,5	95/ 160	H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-400	CHS	BF	SS316	SS316		SS316		CH			
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO			
						125-400	BUT	BF	SS316	SS316	SS316	SS316	B	SO			
CONDENSATES	Foul condensate	6 7,5	95/ 160	H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-400	CHS	BF	SS316	SS316		SS316		CH			
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO			
						125-400	BUT	BF	SS316	SS316	SS316	SS316	B	SO			
CONDENSATES	Secondary condensate A	4.5	80-90/ 100	H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-400	CHS	BF	SS316	SS316		SS316		CH			
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO			
						125-400	BUT	BF	SS316	SS316	SS316	SS316	B	SO			
CONDENSATES	Secondary condensate w ith CH3COOH	5	70/ 100	H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-400	CHS	BF	SS316	SS316		SS316		CH			
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO			
						125-400	BUT	BF	SS316	SS316	SS316	SS316	B	SO			



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		Service Limits		Piping		Valve											
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.					Leakage rate	Function	Remarks		
									Material	Material	Material	Material					
									Body	Disc	Spin	Seat					
CHEMICALS	Ammonium w ater, 24,5%	12/16	25/40	H2	AT	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-200	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE					SO
						125-200	BUT	BF	SS316	SS316	SS316	SS316					SO
CHEMICALS	Felt cleaner		25/60	H2	AT	40-100	CHS	BF	SS316	SS316		SS316		CH			
						10-100	BAL	WE	SS316	SS316/HCHR	SS316	STELL		SO			
CHEMICALS	Hydrochloric acid HCl			L4C	AT	15-150	CHB	FL	CS/PTFE	CS/PTFE		PTFE	A	CH			
						15-150	BAL	FL	NI/FEP	NI/FEP	SS	PTFE				SO	
CHEMICALS	Nitric acid (HNO3)														Material according to temperature (H1 or K2)		
CHEMICALS	Phosphoric acid N3PO4, 40-80%	3/8	/40	H2 *)	AT	15-50	CHD	BF	SS316	SS316		SS316	A	CH	*) Max.temperature 50 °C		
						65-100	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	FL	SS316	SS316	SS316	PTFE					SO
CHEMICALS	Sulphur acid H2SO4, 70%	3/8	30/95	L4C	AT	15-150	CHB	FL	CS/PTFE	CS/PTFE		PTFE	A	CH			
				L6A		15-150	BAL	FL	NI/FEP	NI/FEP	SS	PTFE				SO	
CHEMICALS	Sulphur acid H2SO4, >93%			C1	AT	15-50	CHD	BF	SS	SS		SS	A	CH			
				L6A		65-100	CHS	BF	SS	SS		SS					
						15-100	BAL	FL	NI/FEP	NI/FEP	SS	PTFE				SO	
CHEMICALS	Hydrazine NH2.NH2			H2	AT	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						15-50	BAL	WE	SS316	SS316	SS316	PTFE				SO	
CHEMICALS	Sodium chloride NaCl – (Brine)			S2A	AT	15-150	CHB	FL	CS/PTFE	CS/PTFE		PTFE	A	CH			
				L6AA		15-150	BAL	FL	NI/FEP	NI/FEP	SS	PTFE				SO	
CHEMICALS	Caustic (sodium hydroxide) NaOH, 10-60%	6/16	25/40	H2	AT	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-200	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE					SO
						125-200	BUT	BF	SS316	SS316	SS316	SS316					SO
CHEMICALS	Polymer			H1	AT	15-50	CHD	BF	SS	SS	SS	SS	A	CH			
						15-50	BAL	WE	SS	SS	SS	PTFE				SO	
CHEMICALS	Magnesium hydroxide MgO			H2	AT	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-300	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	FL	SS316	SS316	SS316	PTFE					SO
						125-300	BUT	BF	SS316	SS316	SS316	SS316					SO
EFFLUENTS	Floor drain Drain	/2	/100	H1 S2A L1	AT	80-600	BUT	BF	SS	SS	SS	SS	B	SO			

List of Flow Substances, Selection of Pipe Classes and Valves

[illegible]



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		Service Limits		Piping		Valve											
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks		
									Body	Disc	Spin	Seat					
GASES	Noncondensile concentrated gases	-1/6	110/150	H2	AT	40-300	CHS	BF	SS316	SS316		SS316	A B	CH SO SO			
						25-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-500	BUT	BF	SS316	SS316	SS316	SS316					
GASES	Noncondensile diluted gases	-0.2	80/100	H2	AT	40-300	CHS	BF	SS316	SS316		SS316	A B	CH SO SO	Vacuum 10kPa		
		0.5				25-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-1200	BUT	BF	SS316	SS316	SS316	SS316					
GASES	Exhaust gas, stack gas, flue gas	0.04 0.07	320/400	H2													
GASES	Propane	0.2/10	15/50	C1	AT	10-50	CHG	FL	CS	SS		SS	A	CH CH SO			
						65-100	CHS	BF	CS	SS		SS					
						10-100	BAL	WE	CS	SS	SS	PTFE					
GASES	Stripping off gases	/6	/150	H2	AT	40-300	CHS	BF	SS316	SS316		SS316	A B	CH SO SO			
						25-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-500	BUT	BF	SS316	SS316	SS316	SS316					
LIQUORS	Black liquor – cool																
LIQUORS	Black liquor firing	4/17	130/210	H3	AT	15-50	CHD	BF	SS	SS		SS	B B	CH SO SO SO	*) With scraping seat **) Root valve for tank shall be ball valve		
						65-600	CHS	BF	SS	SS		SS					
						15-400	BAL ^{*)}	FL	SS	SS/HCHR		STELL					
						450-600	BUT ^{*)}	BF	SS			SS					
LIQUORS	Black liquor – heavy (~ about 50%)	3/17	110/210	H1	AT	250-400	BAL ^{*)}	FL	SS	SS/HCHR	SS	STELL	B	SO	*) With scraping seat		



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Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks
									Body	Disc	Spin	Seat			
LIQUORS	Black liquor – intermediate (~ above 30% and ~ below 50%)	4/6	80/110	H1	AT	15-50 65-600 15-100 450-600	CHD CHS BAL BUT	BF BF WE BF	SS SS SS SS	SS SS SS SS	SS SS PTFE SS	A B	CH SO SO SO		
LIQUORS	Black Liquor - hot														
LIQUORS	Black Liquor – weak (up to ~ 30 %)	4/8	90/110	H1	AT	15-50 65-600 15-100 450-600	CHD CHS BAL BUT	BF BF WE BF	SS SS SS SS	SS SS SS SS	SS SS PTFE SS	A B	CH SO SO SO	In case spooling medium pressure steam values shall be used.	
LIQUORS	Green liquor clarified	5/7	95/120	H1	AT	40-500 25-400	CHS BAL ¹⁾	BF FL	SS SS	SS SS/HCHR	SS	SS STELL	B	CH SO	*) With scraping seat
LIQUORS	Green liquor unclarified	7/8	95/120	H1	AT	40-500 25-400	CHS BAL ¹⁾	BF FL	SS SS	SS SS/HCHR	SS	SS STELL	B	CH SO	*) With scraping seat
LIQUORS	Causticized liquor			H1	AT	40-500 25-400	CHS BAL ¹⁾	BF FL	SS SS	SS SS/HCHR	SS	SS STELL	B	CH SO	*) With scraping seat
LIQUORS	Slaked liquor			H2	AT	15-50 65-300 15-300	CHD CHS BAL	BF BF FL	SS316 SS316 SS316	SS316 SS316 SS/HCHR	SS316	SS316 SS316 STELL	B	CH CH SO	
LIQUORS	White liquor hot	7/8	98/110	H1	AT	15-50 65-600 15-100 15-100 125-600	CHD CHS BAL BAL BUT	BF BF WE FL BF	SS SS SS SS SS	SS SS SS SS SS	SS SS PTFE PTFE SS	A A A B	CH SO SO SO SO		
LIQUORS	Weak w ash	7/8	95/110	H1	AT	15-50 65-600 15-100 15-100 125-600	CHD CHS BAL BAL BUT	BF BF WE FL BF	SS SS SS SS SS	SS SS SS SS SS	SS SS PTFE PTFE SS	A A A B	CH SO SO SO SO		
LIQUORS	Red liquor firing	4/17	130/210	H2	AT	15-50 65-600 15-400 450-600	CHD CHS BAL ^{1*)} BUT ¹⁾	BF BF FL BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316/HCHR SS316	SS316	SS316 SS316 STELL SS316	B B	CH SO SO SO	*) With scraping seat **) Root valve for tank shall be ball valve



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Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks	
									Body	Disc	Spin	Seat				
LIQUORS	Red liquor – heavy (~ above 50%)	3/17	110/210	H2	AT	25-400	BAL ^{*)}	FL	SS316	SS316/HCHR	SS316	STELL	B	SO	*) With scraping seat	
LIQUORS	Red liquor – intermediate (~ above 10% and ~ below 50%)	4/6	80/110	H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH		
						65-600	CHS	BF	SS316	SS316		SS316		SO		
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO		
						450-600	BUT	BF	SS316	SS316	SS316	SS316	B	SO		
LIQUORS	Red liquor – hot			H2												
LIQUORS	Red liquor – weak (up to ~ 10 %)	4/8	90/110	H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH	In case spooling medium pressure steam values shall be used.	
						65-600	CHS	BF	SS316	SS316		SS316		SO		
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO		
						450-600	BUT	BF	SS316	SS316	SS316	SS316	B	SO		
LIQUORS	NSSC cooking liquor, Mix of NH4HSO3 and (NH4)2SO3	7/8	98/110	H2	AT	65-600	CHD	BF	SS316	SS316		SS316		CH		
						15-100	CHS	BF	SS316	SS316		SS316		SO		
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO		
						125-600	BAL	FL	SS316	SS316	SS316	PTFE	A	SO		
OILS AND FUELS	Fuel oil			C1	AT	50-125	CHS	BF	CS	SS		SS		CH		
						15-125	BAL	WE	CS	SS	SS	PTFE	A	SO		
OILS AND FUELS	Hydraulic liquids			H2	AT	15-50	CHD	BF	SS316	SS316		SS316		CH		
						65-200	CHS	BF	SS316	SS316		SS316		CH		
						15-200	BAL	WE	SS316	SS316	SS316	STELL	B	SO		
OILS AND FUELS	Diesel oil			C1	AT	40-50	CHD	BF	SS	SS		SS		CH		
						65-100	CHS	BF	SS	SS		SS		CH		
						40-100	BAL	WE	CS	SS	SS	PTFE	A	SO		
OILS AND FUELS	Hydraulic oil Lubrication oil			H2	AT	15-40	BAL	WE	SS316	SS316	SS316	PTFE	A	SO		
OILS AND FUELS	Stove oil			C1	AT	50-100	CHS	BF	CS	SS		SS		CH		
PULPS	Stock piping	8/10	45/100	H2	AT	15-100	BAL	WE	CS	SS	SS	PTFE	A	SO		
						15-100	BAL	WE	CS	SS	SS	PTFE	A	SO		
						125-600	BUT	BF	SS316	SS316	SS316	SS316	B	SO		
						125-600	BUT	BF	SS316	SS316	SS316	SS316	B	SO		
PULPS	Bleached kraft stock	4/8 13/21	80/95 80/95	H2	AT	65-800	CHS	BF	SS316	SS316		SS316		CH	1) Concistence over 3%	
						100-800	SLI ¹⁾	BF	SS316	SS316	SS316	PTFE	B	SO		
						15-100	BAL	WE	SS316	SS316	SS316	PTFE	A	SO		
						125-600	BUT	BF	SS316	SS316	SS316	SS316	B	SO		



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve									
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks
									Body	Disc	Spin	Seat			
PULPS	Broke	4/6	45/60	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316		SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%
PULPS	Groundw ood stock			H1	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS SS SS SS	SS SS SS SS	SS SS SS SS	SS PTFE PTFE SS	B A A B	CH SO SO SO	1) Concistence over 3%
PULPS	Groundw ood stock - bleached			H2	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A A B	CH SO SO SO	1) Concistence over 3%
PULPS	Hardw ood stock		55/65	H1	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS SS SS SS	SS SS SS SS	SS SS SS SS	SS PTFE PTFE SS	B A A B	CH SO SO SO	1) Concistence over 3%
PULPS	Hardw ood stock - bleached	4/6	45/60	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A A B	CH SO SO SO	1) Concistence over 3%
PULPS	Knots	3/5	95/100	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A A B	CH SO SO SO	1) Concistence over 3%
PULPS	NSSC pulp		55/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	Pulp > 2.5%, ball valves to be used with high temperatures and pressures 1) Concistence over 3%
PULPS	Recycled fiber	4/8	45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A A B	CH SO SO SO	1) Concistence over 3%



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve									
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks
									Body	Disc	Spin	Seat			
PULPS	Couch broke		45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Drying section broke		45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Broke from handling Broke from presses Size press broke		45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Paper stock		45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Short fiber pulp Long fiber pulp		45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Softw ook stock	6/8	45/65	H1	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS SS SS SS	SS SS SS SS	SS PTFE PTFE SS	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Softw ook stock - bleached	6/8	45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
PULPS	Stock from filter		45/65	H2	AT	65-800 100-800 15-100 125-600	CHS SLI ⁽¹⁾ BAL BUT	BF BF WE BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316 SS316	SS316 PTFE PTFE SS316	B A B	CH SO SO SO	1) Concistence over 3%	
SOLIDS	Sulphate ash/w ater slurry	13/20	80/95	H3	AT	15-50 65-200 15-200	CHD CHS BAL	BF BF FL	SS SS SS	SS SS SS	SS SS PTFE	A	CH CH SO		
SOLIDS	Returned sludge	5/8	35/50	H2	AT	loka.50 65-300 15-100 125-300	CHD CHS BAL BUT	BF BF FL BF	SS316 SS316 SS316 SS316	SS316 SS316 SS316/HCHR SS316	SS316 SS316 SS316 SS316	B B	CH CH SO SO		



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve											
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.					Leakage rate	Function	Remarks		
									Body	Disc	Spin	Seat					
SOLIDS	Mill effluent sludge Floating sludge	5/8	35/50	H2	AT	10-50	CHD	BF	SS316	SS316	SS316	SS316	B	CH			
						65-300	CHS	BF	SS316	SS316							
						15-100	BAL	FL	SS316	SS316/HCHR		STELL				SO	
						125-300	BUT	BF	SS316	SS316		STELL				SO	
SOLIDS	Mechanistic de-w atering sludge	6/8	35/50	H1	AT	10-50	CHD	BF	SS	SS	SS	SS	B	CH			
						65-300	CHS	BF	SS	SS		STELL				CH	
						15-300	BAL	FL	SS	SS/HCHR		STELL				SO	
SOLIDS	Non-treated sludge Excess sludge Mixed sludge	5/8	35/50	H1	AT	10-50	CHD	BF	SS	SS	SS	SS	B	CH			
						65-300	CHS	BF	SS	SS		STELL				CH	
						15-300	BAL	FL	SS	SS/HCHR		STELL				SO	
STEAMS	Steam 6 bar (g)	3.5/ 5.3	155/200	C1	GF	15-50	CHG	FL	CS	SS	SS	SS	B	CH			
						65-800	CHS	BF	CS	SS		SS				STELL	CH
						15-65	GLO	WE	CS	SS		SS				STELL	SO
						80-800	GAT	WE	CS	SS		SS				STELL	SO
STEAMS	Steam 16 bar (g)	11/ 17	200/250	C1	GF	15-50	CHG	FL	CS	SS	SS	STELL	B	CH			
						65-600	CHS	BF	CS	SS		STELL				CH	
						15-65	GLO	WE	CS	SS		SS				STELL	SO
						80-600	GAT	WE	CS	SS		SS				STELL	SO
STEAMS	Steam 25 bar (g)	26/ 40	350/460	C2	AB	15-50	CHG	WE	SA	SS	SS	STELL	B	CH			
						65-300	CHS	WE	SA	SS		STELL				CH	
						15-65	GLO	WE	SA	SS		SS				STELL	SO
						80-300	GAT	WE	SA	SS		SS				STELL	SO
				Material selections have to be confirmed by designer and/or supplier w hen project design values are confirmed.													
STEAMS	Steam 110 MPa (g)	34/ 110	498/513	C4/C5	AB	15-50	CHG	WE	SA	SS	SS	STELL	B	CH			
						65-700	CHS	WE	SA	SS		STELL				CH	
						15-65	GLO	WE	SA	SS		SS				STELL	SO
						80-700	GAT	WE	SA	SS		SS				STELL	SO
Material selections have to be confirmed by designer and/or supplier w hen project design values are confirmed.																	
STEAMS	Secondary flash steam	/5 /16	140/160 180/210	C1	GF	15-50	CHG	FL	CS	SS	SS	STELL	B	CH			
						65-600	CHS	BF	CS	SS		STELL				CH	
						15-65	GLO	WE	CS	SS		SS				STELL	SO
						80-600	GAT	WE	CS	SS		SS				STELL	SO



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve											
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.					Leakage rate	Function	Remarks		
									Body	Disc	Spin	Seat					
STEAMS	Secondary steam from Red liquor	/5	120/160	C1	GF	15-50	CHG	FL	CS	SS		SS	B	CH			
						65-600	CHS	BF	CS	SS		SS					
						15-65	GLO	WE	CS	SS	SS	STELL				SO	
						80-600	GAT	WE	CS	SS	SS	STELL					
STEAMS	Secondary steam exhaust			H2	AT	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-600	CHS	BF	SS316	SS316		SS316					
						15-65	BAL	WE	SS316	SS316	SS316	PTFE				SO	
						80-600	BUT	BF	SS316	SS316	SS316	SS316					
STEAMS	Vapor line			H2	AT												
WATERS	Reinforced sealing w ater		15/50	H1	AA	15-50	CHD	BF	SS	SS		SS		CH			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE				SO	
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Cooled w ater			H1	AA	15-50	CHD	BF	SS	SS		SS		CH			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE				SO	
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Clear w ater			H2	AA	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-600	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE				SO	
						125-600	BUT	BF	SS316	SS316	SS316	SS316					
WATERS	Sink w ater, rain w ater	3/8	15/25	H1	AA	15-50	CHD	BF	SS	SS		SS	A	CH			
						65-300	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE				SO	
						125-300	BUT	BF	SS	SS	SS	SS					
WATERS	Sew age w ater	3/8	35/50	H1/H2	AA	15-50	CHD	BF	SS / SS316	SS / SS316		SS / SS316	A	CH	Valve material according to pipe class material group		
						65-300	CHS	BF	SS / SS316	SS / SS316		SS / SS316					
						15-100	BAL	WE	SS / SS316	SS / SS316	SS / SS316	PTFE				SO	
						125-300	BUT	BF	SS / SS316	SS / SS316	SS / SS316	SS / SS316					
WATERS	Brow n stock filtrate	/9	65/75	H2	AA	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-300	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE				SO	
						125-300	BUT	BF	SS316	SS316	SS316	SS316					
WATERS	Mill effluent filtrate	3/8	35/50														
WATERS	HP White w ater			H2	AA	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-600	CHS	BF	SS316	SS316		SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE				SO	
						125-600	BUT	BF	SS316	SS316	SS316	SS316					



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve											
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.					Leakage rate	Function	Remarks		
									Body	Disc	Spin	Seat					
WATERS	Vacuum waste water			H2	AA	15-50	CHD	BF	SS316	SS316		SS316		CH			
						65-600	CHS	BF	SS316	SS316	SS316	SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-600	BUT	BF	SS316	SS316	SS316	SS316					
WATERS	Barker water – high pressure			H2	AA	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-600	CHS	BF	SS316	SS316	SS316	SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-600	BUT	BF	SS316	SS316	SS316	SS316					
WATERS	Boiler blow down			C2 C3													
WATERS	Boiler blow off			C2 C3													
WATERS	Chemically treated water	/10	/95	H1	AA	15-50	CHD	BF	SS	SS		SS	A	CH			
						65-600	CHS	BF	SS	SS	SS	SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Fire protection water	5/15	15/50	C1	AA	15-50	CHG	FL	CS	SS		SS	B	CH			
						65-400	CHS	BF	CS	SS	SS	SS					
						15-65	GLO	WE	CS	SS	SS	STELL					
						80-400	GAT	WE	CS	SS	SS	STELL					
WATERS	Fire protection water with temper (foamer)														Material to be checked case by case		
WATERS	Hot water			H1	AA	15-50	CHD	BF	SS	SS		SS	A	CH			
						65-600	CHS	BF	SS	SS	SS	SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Water hot heating	6/10	90/120	H2	AA	15-50	CHD	BF	SS316	SS316		SS316	A	CH			
						65-600	CHS	BF	SS316	SS316	SS316	SS316					
						15-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-600	BUT	BF	SS316	SS316	SS316	SS316					
WATERS	Supply water	3/8	15/35	H1	AA	15-50	CHD	BF	SS	SS		SS	A	CH			
						65-600	CHS	BF	SS	SS	SS	SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve											
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.					Leakage rate	Function	Remarks		
									Body	Disc	Spin	Seat					
WATERS	Cooling w ater		-50	H1	AA	15-50	CHD	BF	SS	SS		SS	A B	CH CH SO SO			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Flush w ater		-50	H1	AA	15-50	CHD	BF	SS	SS		SS		CH CH SO SO			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Warm w ater		-70	H1	AA	15-50	CHD	BF	SS	SS		SS		CH CH SO SO			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Mill w ater cold	5/8	25/45	H1	AA	15-50	CHD	BF	SS	SS		SS	A B	CH CH SO SO			
						65-800	CHS	BF	SS	SS		SS					
		/10	/200			15-100	BAL	WE	SS	SS	SS	PTFE					
						125-800	BUT	BF	SS	SS	SS	EPDM					
WATERS	Fresh w ater piping		-50	H1	AA	15-50	CHD	BF	SS	SS		SS		CH CH SO SO			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					
WATERS	Cold w ater w ith glycol	2.5/ 8.6	70/100	H1	AA	15-50	CHD	BF	SS	SS		SS	A B	CH CH SO SO			
						65-600	CHS	BF	SS	SS		SS					
		15-100				BAL	WE	SS	SS	SS	PTFE						
		125-600				BUT	BF	SS	SS	SS	SS						
WATERS	Mill w ater hot	3/5	65/75	H2	AA	15-50	CHD	BF	SS316	SS316		SS316	A B	CH CH SO SO			
						65-600	CHS	BF	SS316	SS316		SS316					
		0/6	100/250			15-100	BAL	WE	SS316	SS316	SS316	PTFE					
						125-600	BUT	BF	SS316	SS316	SS316	SS316					
WATERS	Mill w ater w arm	3/8	45/80	H1	AA	15-50	CHD	BF	SS	SS		SS	A B	CH CH SO SO			
						65-800	CHS	BF	SS	SS		SS					
		3.5/10	45/80			15-100	BAL	WE	SS	SS	SS	PTFE					
						125-800	BUT	BF	SS	SS	SS	EPDM					
WATERS	Drinking w ater	0,3/0,8	20/50	H1	AA	15-50	CHD	BF	SS	SS		SS	A B	CH CH SO SO			
						65-600	CHS	BF	SS	SS		SS					
						15-100	BAL	WE	SS	SS	SS	PTFE					
						125-600	BUT	BF	SS	SS	SS	SS					



List of Flow Substances, Selection of Pipe Classes and Valves

		Service Limits		Piping		Valve									
Group	Flow substance	Press. operat./ design bar (g)	Temp. operat./ design. ° C	Pipe Material	Gasket type	Size range	Type	Conn.	Material				Leakage rate	Function	Remarks
									Body	Disc	Spin	Seat			
WATERS	Sealing w ater	/6	25/50	H1	AA	15-50	CHD	BF	SS	SS		SS	A B	CH	
						65-600	CHS	BF	SS	SS		SS		CH	
						15-65	BAL	WE	SS	SS	SS	PTFE		SO	
						80-600	BUT	BF	SS	SS	SS	SS		SO	
WATERS	Back w ater		65/95	H2	AA	15-50	CHD	BF	SS316	SS316		SS316		CH	
						65-600	CHS	BF	SS316	SS316		SS316		CH	
						15-100	BAL	WE	SS316	SS316	SS316	PTFE		SO	
						125-600	BUT	BF	SS316	SS316	SS316	SS316		SO	
WATERS	Waste w ater														
WATERS	White w ater	4/8	/95	H2	AA	15-50	CHD	BF	SS316	SS316		SS316		CH	
						65-600	CHS	BF	SS316	SS316		SS316		CH	
						15-100	BAL	WE	SS316	SS316	SS316	PTFE		SO	
						125-600	BUT	BF	SS316	SS316	SS316	SS316		SO	