- Boiler feedwater pump system
- Anti-cavitation, abrasion-resistant
- Circulatory convection mechanism
- Disc stack construction

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Delan 德兰调节阀

DELAN MX2500 SERIES

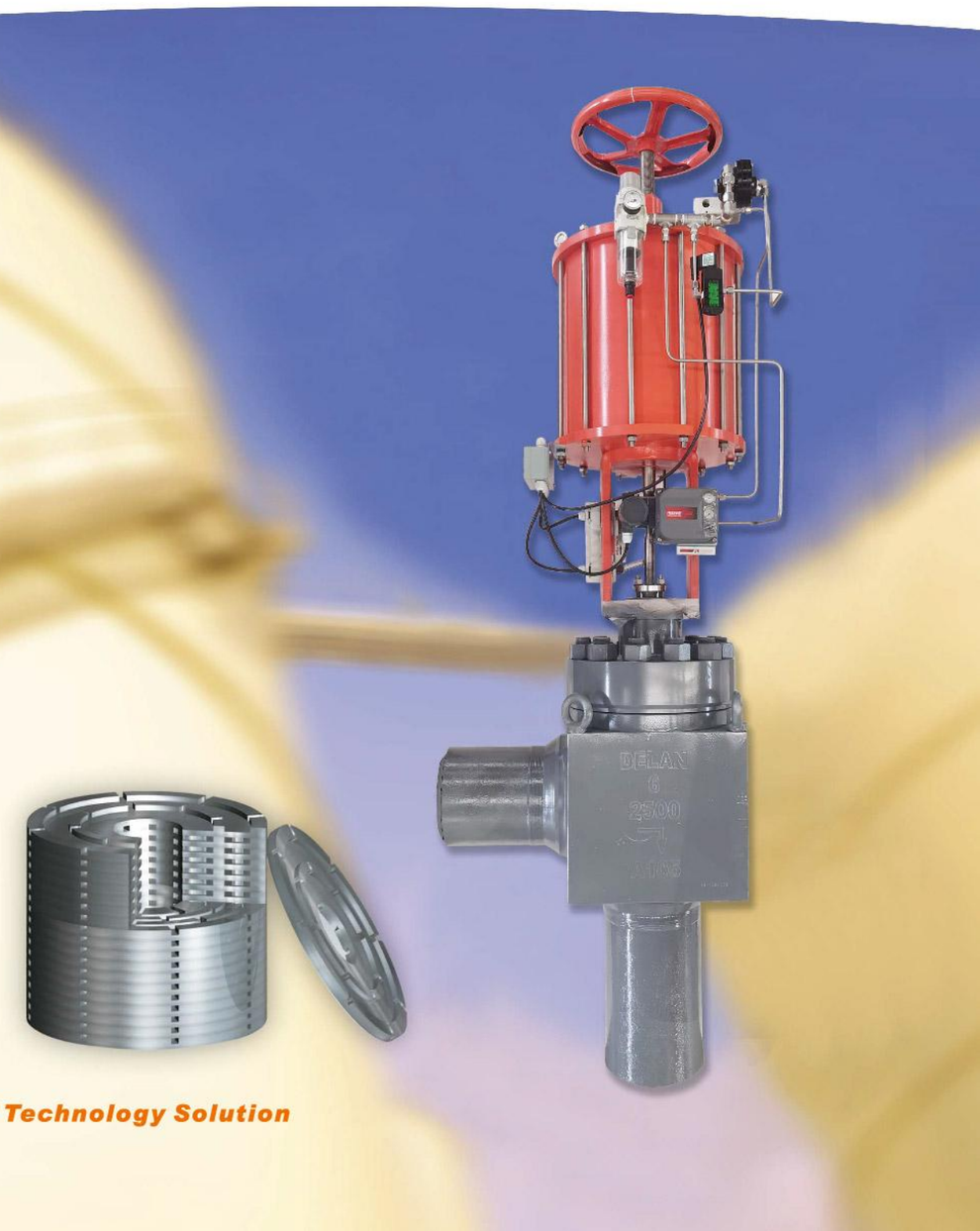
Delan 德兰调节阀

DELAN MX2500 SERIES

Delan®

MX2500 Series

Minimun Flow Recirculation Valve



Energy Fluid Technology Solution

Delan 德兰调节阀

DELAN MX2500 SERIES

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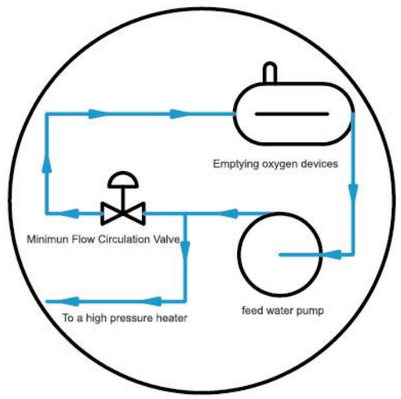
Typical Application

Minimum flow circulation valve is the key supporting equipment of power plant’s boiler feedwater pump.

Boiler water from the feedwater pump will be pressurized up to 20–30Mpa or above in the deaerator then sent to the high pressure heater and eventrally into the boiler. A certain minimum flow quantity of the feedwater pump should be ensured to take away the heat generated by its operation so as to avoid overheating and damage of vanes due to cavitation. Boiler feedwater flow is small during the startup and shutdown process while the water demand decreases in condition of breakdown. In order to ensure the normal operation of the pump, a recirculation system should be mounted in the pump outlet to carry a portion of the feedwater back to the deaerator from the pump.

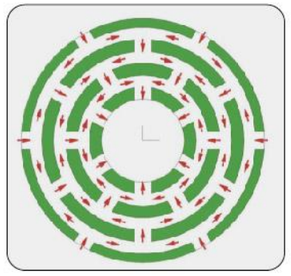


Valve Characteristic

Circulatory convection mechanism, multi-stage pressure reducing

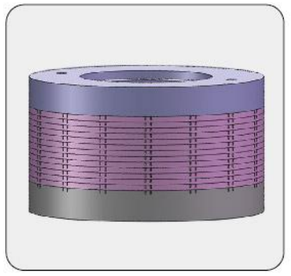
Innovative design concept

Circulatory convection structure control valve is a new generation of control valve for high pressure difference and anti–cavitation application which is developed from multiple orifice, anti–cavitation sleeve valve, multi–stage plug throttle control valve and labyrinth disc control valve. Circulatory convection disc, as the key component applies special structure and technology. Compared with the popular labyrinch disc, it has the similar appearance but rather different function and mechanism. Labyrinch disc has several independent and tortuous groove passages on the round disc which can add resistance and reduce pressure gradually through a number of turns and then prevent cavitation during the process of pressure reducing. Circulatory convection disc also has dozens of groove passages. Fluid makes their way from outer ring to inner ring through the Radial slot. During this process, a portion of the fluid devided while the other portion joined together. The hit, friction and swirl produced by the high speed molecule will consume a large volume of energy and reduce pressure more efficiently. It has a better pressure reducing, anti–cavitation, noise attenuation performance and longer service life compared with labyrinth disc.



circulatory convection mechanism

disc stack



welding assembly

Valve Characteristic

Eight peculiar advantages

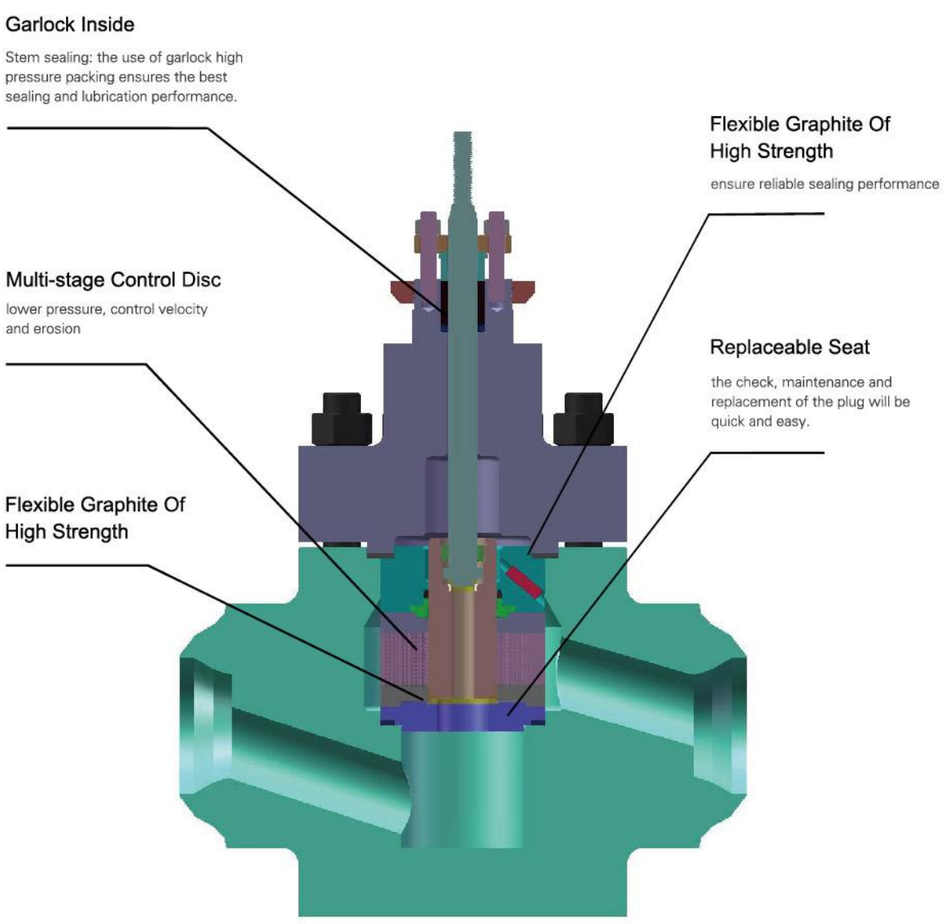
With scientific design principle, proper inner structure, high-performance material and original technique, our minimum flow valve has some unique advantages as bellows:

- Circulatory convection, multi-stage pressure reducing mechanism, avoide cavitation efficiently, prolong service life.
- All the trims can be quickly removed and replaced, easy to maintain with less cost.
- Imported high-quality stem packing ensures leak-free without frequent replacement.
- Scientific construction, high-performance materials and exquisite workmanship enable both the plug and cage to have excellent anti-blocking and anti-seizure performance so that a small amount of sundries in the pipeline will not lead to any blocking for the passage nor seizure for the plug in condition of frequent openning
- Appropriately matched plug and cage materials provide an excellent resistance for abrasion, scraching and seizure.
- Zero leakage, long-service life and low breakdown rate ensure a safe and reliable operation of the feedwater pump.

Design Standards

- Design and manufature: ASME B16.34, NB/T47044
- Check and test: NB/T47044, API598, MSS SP-61
- Design level: Special level, Restricted level, Standard level
- End connection
  - butt weldingends: ASME B16.25
  - flange ends: ASME B16.11

Anatomical Drawing



Technical Parameters

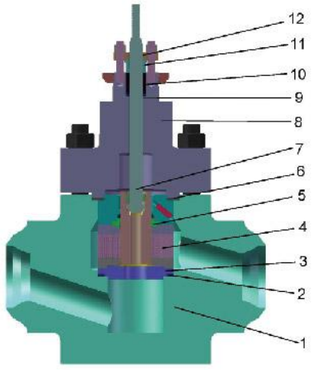
Table 1

Nominal diameter	3/4 "to 8" (optional up to 12 ")
Nominal pressure	ANSI 1500Lb~4500Lb
Valve body type	Straight through and angled
Usage temperature	-29℃~300℃ (special temperature can be customized)
Material Science	See Table 2
Traffic characteristics	1. Standard - Linear 2. Or develop traffic characteristics suitable for practical applications
Adjustable ratio	30:1~50:1
Rated travel	See Table 3
Leakage rate	MSS SP-61
discharge coefficient	See Table 3
External dimensions and weight	See Table 3
Flow direction	Flow off
control signal	Switching control, 4-20mA DC Analog control
Power source	Electric: 380V three-phase, 220V single-phase Pneumatic: 0.4-0.7MPa

Material Table

Table 2

Number	Name	Material			
1	Valve body ①	A105/WCB	F316	WC9/F22	WB36
2	Valve seat gasket	Flexible graphite+304 winding pad			
3	valve seat	304+stellite			
4	Disc components	410			
5	Elastic energy storage ring ②	PTFE			
6	Medium flange gasket	Flexible graphite+304 winding pad			
7	Valve stem ①	410			
8	Valve cover	A105	F316	F22	WB36
9	Packing pad	304			
10	filler	PTFE/flexible graphite			
11	Compression sleeve	304			
12	Pressure plate	45 plated with white zinc			



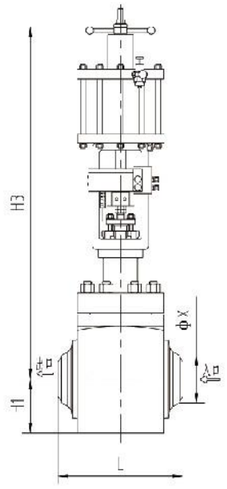
Material List Diagram

Note:

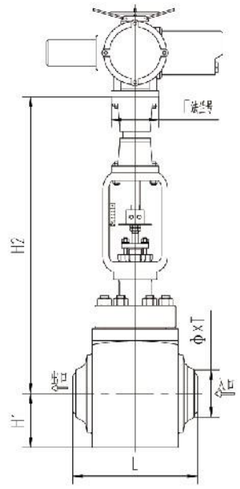
① The valve body and stem can be provided with other materials according to customer requirements;

② The valve body structure with a standard NPS<2 "is unbalanced and does not use elastic energy s torage rings or labyrinth pins;

Dimension and Weight



pneumatic straght-through way minimum flow valve



electric minimum flow valve

Table 3: Dimensions and Weight of Minimum Flow Valves for Standard NPS 1-1/2 "~8"

Nominal Diameter		Rated travel	Design flow	Pressure P≤22MPa	Pressure P>22MPa	Structural style	Length		H1	H2	H3	F ISO5210	φ × T	Weight
							Forging	Cast						
Inch	mm	mm	m^3/h	Cv	Cv		mm	mm	mm	mm	mm			Kg
≤1-1/2	≤40	38	48	3.5	-	Balanced type	250	-	100	570	840	F10	Configure according to user pipeline	80
≤1-1/2	≤40	51	48	5.3	-	Balanced type	250	-	100	570	840	F10		80
2	50	51	75	7.9	-	Forerunner balanced type	318	400	135	570	840	F10		110
2	50	51	75	-	5.8	Forerunner balanced type	318	400	135	570	840	F10		110
3	80	51	105	10.5	-	Forerunner balanced type	381	498	145	570	840	F10		185
3	80	51	105	-	8.4	Forerunner balanced type	381	498	145	670	840	F10		185
4	100	76	200	15.2	-	Forerunner balanced type	498	575	168	670	1100	F14		340
4	100	76	200	-	12.1	Forerunner balanced type	498	575	168	670	1100	F14		340
4	100	76	200	20.1	-	Forerunner balanced type	498	575	168	670	1100	F14		340
4	100	76	200	-	16.1	Forerunner balanced type	498	575	168	670	1100	F14		340
6	150	100	325	27.8	-	Forerunner balanced type	575	819	212	670	1300	F14		575
6	150	100	325	-	20.5	Forerunner balanced type	575	819	212	670	1300	F14		575
6	150	100	325	35.5	-	Forerunner balanced type	575	819	212	670	1300	F14		575
6	150	100	325	-	26.5	Forerunner balanced type	575	819	212	670	1300	F14		575
6	150	100	420	43.8	-	Forerunner balanced type	575	819	212	670	1300	F14		575
6	150	100	420	-	33.3	Forerunner balanced type	575	819	212	670	1300	F14		575
6	150	127	530	57.2		Forerunner balanced type	610	-	217	720	1430	F14		650
6	150	127	530		42.6	Forerunner balanced type	610	-	217	720	1430	F14		650
8	200	127	735	73.8	-	Forerunner balanced type	700	-	240	720	1430	F14		650
8	200	127	735	-	55.8	Forerunner balanced type	700	-	240	1450	1430	F14		650

Performance Parameters

Nominal Diameter							
	Inch	≤1-1/2	2	3	4	6	8
	mm	≤40	50	80	100	150	200
Nominal Pressure		1500Lb～4500Lb					
Valve Body Structure		Straight through and angled					
Structural Style		Unbalance	Forerunner balanced type				
Flow Direction		Flow type					
Executing Agency		Electric or pneumatic actuator					
Control Signal		Switching control, 4-20mA DC analog control					
Power Source		Electric: 380V three-phase, 220V single-phase; Pneumatic 0.4-0.7MPa					

Product Model

Table 5

Valve type	Size	Traffic characteristics	Pressure Rating	Connection	Action form	Body Material
MX	2″	E	15	F	1	C
MX-pneumatic Actuator	Metric: mm	E: Equal percentage	15=1500LB	W: Butt Weld	1: Positive effect	C: Carbon steel
KX-Electric Actuator	Imperial: Inch	L: Linear	25=2500LB	S: Socket Weld	2: Reaction effect	V: Chromium molybdenum vanadium alloy steel
			30=3000LB		None: Electric valvesdo not have this page	WB36
			35=3500LB			
			45=4500LB			

Material Pressure-Temperature Ratings

Table 6

Class	Material	Pressure–Temperature Table(Standard) Pressure Bar Temperature℃ 38	50	100	150	200	250	300	325	350	375	400	425	450	475	500	525	538	550	575	600
150	A105/WCB	19	19	17	15	13	12	10	9	8	7	6	5								
	F11/WC6	19	19	17	15	13	12	10	9	8	7	6	5	4	3	2	1	1	1	1	
	F12	19	19	17	15	13	12	10	9	8	7	6	5	4	3	2	1	1	1	1	
	F22/WC9	19	19	17	15	13	12	10	9	8	7	6	5	4	3	2	1	1	1	1	
	F91/C12A	20	19	17	15	13	12	10	9	8	7	6	5	4	3	2	1	1	1	1	1
	F316/CF8M	19	18	16	14	13	12	10	9	8	7	6	5	4	3	2	1	1			
300	A105/WCB	51	50	46	45	43	41	39	38	37	36	34	28								
	F11/WC6	51	51	51	49	48	46	42	41	40	38	36	35	33	31	25	18	14	12	8	
	F12	51	51	50	48	46	44	42	41	40	38	36	35	33	27	21	16	13	12	8	
	F22/WC9	51	51	51	50	48	46	42	41	40	38	36	35	33	31	28	21	18	15	10	
	F91/C12A	51	51	51	50	48	46	42	41	40	38	36	35	33	31	28	26	25	25	24	19
	F316/CF8M	49	48	42	38	35	33	31	30	30	29	29	29	28	28	28	26	25			
600	A105/WCB	102	100	93	90	87	83	79	77	75	72	69	57								
	F11/WC6	103	103	103	99	95	92	85	82	80	77	73	70	67	63	51	37	29	25	17	
	F12	103	103	100	96	92	89	85	82	80	77	73	70	67	55	42	32	27	24	17	
	F22/WC9	103	103	103	100	97	92	85	82	80	77	73	70	67	63	56	43	36	31	21	
	F91/C12A	103	103	103	100	97	92	85	82	80	77	73	70	67	63	56	52	50	49	47	39
	F316/CF8M	99	96	84	77	71	66	63	61	60	59	58	58	57	57	56	52	50			
800	A105/WCB	136	133	124	120	116	111	106	103	100	96	92	76								
	F11/WC6	137	137	137	132	127	123	114	110	107	103	97	93	90	84	68	49	39	33	23	
	F12	137	137	134	128	123	119	114	110	107	103	97	93	90	74	57	43	36	32	23	
	F22/WC9	137	137	137	133	129	123	114	110	107	103	97	93	90	84	75	58	49	41	28	
	F91/C12A	137	137	137	133	129	123	114	110	107	103	97	93	90	84	75	69	66	66	63	52
	F316/CF8M	132	128	112	102	95	89	84	82	80	79	78	77	76	76	75	69	66			
900	A105/WCB	153	150	139	135	131	125	119	116	112	109	104	86								
	F11/WC6	155	155	154	149	143	139	128	124	120	116	109	105	101	95	77	55	44	38	26	
	F12	155	154	151	144	138	134	128	124	120	116	109	105	101	83	64	48	41	36	26	
	F22/WC9	155	155	154	150	145	139	128	124	120	116	109	105	101	95	84	65	55	46	31	
	F91/C12A	155	155	154	150	145	139	128	124	120	116	109	105	101	95	84	78	75	74	71	58
	F316/CF8M	148	144	126	115	107	100	94	92	91	89	88	87	86	86	84	78	75			
1500	A105/WCB	255	250	233	225	219	209	199	193	187	181	173	143								
	F11/WC6	258	258	257	248	239	231	214	206	201	194	183	175	169	158	128	93	74	63	44	
	F12	258	257	252	240	231	224	214	206	201	194	183	175	169	139	106	81	68	60	44	
	F22/WC9	258	258	257	250	243	231	214	206	201	194	183	175	169	158	140	108	92	78	52	
	F91/C12A	258	258	257	250	243	231	214	206	201	194	183	175	169	158	140	130	125	124	119	97
	F316/CF8M	248	240	211	192	178	166	158	154	151	149	147	145	144	143	140	130	125			
1700	A105/WCB	289	284	264	255	248	237	225	219	212	206	196	162								
	F11/WC6	293	293	291	281	271	262	242	234	227	219	207	198	191	179	145	105	84	71	49	
	F12	293	291	285	273	262	253	242	234	227	219	207	198	191	157	121	92	77	68	49	
	F22/WC9	293	293	291	284	275	262	242	234	227	219	207	198	191	179	159	123	104	88	59	
	F91/C12A	293	293	291	284	275	262	242	234	227	219	207	198	191	179	159	148	142	141	135	110
	F316/CF8M	281	272	239	218	202	189	179	175	171	169	166	165	163	162	159	148	142			
2500	A105/WCB	425	417	388	375	365	349	331	322	313	303	289	239								
	F11/WC6	430	430	429	414	399	386	357	344	335	323	304	291	281	263	214	154	124	105	73	
	F12	430	429	420	401	385	373	357	344	335	323	304	291	281	232	178	136	114	100	73	
	F22/WC9	430	430	429	418	405	386	357	344	335	323	304	291	281	263	235	181	153	130	87	
	F91/C12A	430	430	429	418	405	386	357	344	335	323	304	291	281	263	235	217	208	208	199	162
	F316/CF8M	413	400	351	320	297	278	263	257	252	249	245	242	240	238	235	217	208			
2700	A105/WCB	459	451	419	405	394	377	358	348	338	327	312	258								
	F11/WC6	465	465	463	447	431	417	385	371	362	349	329	314	304	284	231	167	134	114	79	
	F12	465	463	454	433	416	403	385	371	362	349	329	314	304	250	192	147	123	108	79	
	F22/WC9	465	465	463	451	437	417	385	371	362	349	329	314	304	284	253	196	165	140	94	
	F91/C12A	465	465	463	451	437	417	385	371	362	349	329	314	304	284	253	235	225	224	215	175
	F316/CF8M	446	432	379	346	320	300	284	277	272	268	264	262	259	258	253	235	225			
3000	A105/WCB	510	501	465	450	438	419	398	387	375	363	347	287								
	F11/WC6	517	517	514	497	479	463	428	413	402	387	365	349	338	316	257	185	148	127	88	
	F12	517	515	504	481	462	448	428	413	402	387	365	349	338	278	213	163	137	120	88	
	F22/WC9	517	517	515	501	486	463	428	413	402	387	365	349	338	316	282	217	184	156	105	
	F91/C12A	517	517	515	501	486	463	428	413	402	387	365	349	338	316	282	261	250	249	239	195
	F316/CF8M	496	481	421	384	356	333	316	308	303	298	294	291	288	286	282	261	250			
4500	A105/WCB	765	751	699	676	657	629	597	580	563	545	520	431								
	F11/WC6	775	775	772	746	719	694	642	619	603	581	548	524	507	474	385	278	223	190	132	
	F12	775	772	756	722	694	672	642	619	603	581	548	524	507	417	320	245	205	180	132	
	F22/WC9	775	775	773	752	729	694	642	619	603	581	548	524	507	474	423	326	276	234	157	
	F91/C12A	775	775	773	752	729	694	642	619	603	581	548	524	507	474	423	391	375	374	359	292
	F316/CF8M	744	721	632	577	534	500	474	463	454	448	441	437	432	430	423	391	375			

Material Pressure-Temperature Ratings

Table 7

Class	Material	Pressure–Temperature Table(Standard) Pressure Bar Temperature℃ 38	50	100	150	200	250	300	325	350	375	400	425	450	475	500	525	538	550	575	600
150	A105/WCB	19	19	19	19	19	19	19	19	18	18	16	13								
	F11/WC6	19	19	19	19	19	19	19	19	19	19	19	19	18	16	12	8	7	6	4	
	F12	19	19	19	19	19	19	18	18	18	18	18	18	18	16	13	10	7	6	5	4
	F22/WC9	19	19	19	19	19	19	19	19	18	18	18	18	18	16	13	10	8	7	5	
	F91/C12A	20	20	20	20	20	20	20	20	19	19	19	19	18	16	13	11	11	11	10	9
	F316/CF8M	19	19	18	16	15	14	13	13	13	12	12	12	12	12	12	11	11			
300	A105/WCB	51	51	51	51	50	50	50	50	48	47	43	36								
	F11/WC6	51	51	51	51	51	51	51	51	51	50	50	49	47	42	32	23	18	15	11	
	F12	51	51	50	49	49	49	49	48	47	47	47	47	43	34	26	20	17	15	11	
	F22/WC9	51	51	51	51	50	50	49	49	49	48	48	48	47	42	35	27	23	19	13	
	F91/C12A	51	51	51	51	51	51	51	51	51	50	50	49	47	42	35	31	29	29	28	24
	F316/CF8M	51	50	47	43	39	37	35	34	33	33	32	32	32	32	31	29	29			
600	A105/WCB	103	103	103	102	101	101	101	100	97	94	86	71								
	F11/WC6	103	103	103	103	103	103	103	103	102	101	100	99	94	85	64	46	37	31	22	
	F12	103	103	101	99	99	99	98	97	95	94	94	94	86	69	53	40	34	30	22	
	F22/WC9	103	103	103	101	100	100	99	99	98	97	97	97	94	85	71	54	46	39	26	
	F91/C12A	103	103	103	103	103	103	103	103	102	101	100	99	94	85	71	62	57	57	57	48
	F316/CF8M	103	101	94	85	79	74	70	68	67	65	65	65	64	64	63	59	57			
800	A105/WCB	137	137	137	136	134	134	134	133	130	125	115	95								
	F11/WC6	137	137	137	137	137	137	137	137	137	134	133	132	125	113	85	61	49	42	29	
	F12	137	137	135	132	132	132	130	129	127	125	125	125	114	92	71	54	45	40	29	
	F22/WC9	137	137	137	135	133	133	132	132	131	130	130	130	125	113	95	72	61	52	35	
	F91/C12A	137	137	137	137	137	137	137	137	137	134	133	132	125	113	95	83	77	77	76	64
	F316/CF8M	137	135	125	114	106	99	94	91	90	88	87	86	85	85	84	79	77			
900	A105/WCB	155	155	154	153	151	151	151	150	146	141	130	107								
	F11/WC6	155	155	155	155	155	155	155	155	154	151	150	148	141	128	96	69	55	47	33	
	F12	155	154	151	149	149	148	147	145	143	141	141	141	129	104	80	61	51	45	33	
	F22/WC9	155	155	154	152	150	149	149	148	147	146	146	146	141	128	107	82	69	58	39	
	F91/C12A	155	155	155	155	155	155	155	155	154	151	150	148	141	128	107	93	86	86	85	73
	F316/CF8M	155	152	141	128	119	111	105	103	101	100	98	97	96	96	95	89	86			
1500	A105/WCB	258	258	258	255	252	252	252	250	244	235	217	179								
	F11/WC6	258	258	258	258	258	258	258	258	257	252	251	248	235	213	160	116	93	79	55	
	F12	258	257	253	248	248	248	245	242	239	235	235	235	215	174	133	102	85	75	55	
	F22/WC9	258	258	258	254	251	249	248	248	246	243	243	243	235	213	178	136	115	97	65	
	F91/C12A	258	258	258	258	258	258	258	258	257	252	251	248	235	213	178	156	145	145	143	121
	F316/CF8M	258	254	235	214	199	186	176	172	169	166	164	162	161	160	158	149	145			
1700	A105/WCB	293	293	292	289	286	286	286	284	277	266	245	203								
	F11/WC6	293	293	293	293	293	293	293	293	291	286	284	281	267	242	182	131	105	90	62	
	F12	293	291	286	281	281	281	277	275	271	266	266	266	243	197	151	115	97	85	62	
	F22/WC9	293	293	292	288	284	283	282	281	278	276	276	276	267	242	202	155	130	110	74	
	F91/C12A	293	293	293	293	293	293	293	293	291	286	284	281	267	242	202	177	164	164	162	138
	F316/CF8M	293	287	266	243	225	211	199	195	191	188	186	184	182	181	179	169	164			
2500	A105/WCB	430	430	430	425	421	421	421	417	407	392	361	299								
	F11/WC6	430	430	430	430	430	430	430	430	428	420	418	413	393	356	268	193	155	132	91	
	F12	430	429	421	414	413	408	404	398	392	392	392	392	358	290	222	170	142	125	91	
	F22/WC9	430	430	430	424	418	416	414	413	410	406	406	406	393	356	297	228	192	162	109	
	F91/C12A	430	430	430	430	430	430	430	430	428	420	418	413	393	356	297	260	241	241	238	203
	F316/CF8M	430	423	392	358	331	310	294	287	282	277	273	271	268	266	264	249	241			
2700	A105/WCB	465	465	464	459	455	454	454	451	440	423	390	232								
	F11/WC6	465	465	465	465	465	465	465	465	462	454	451	446	424	384	289	209	167	142	99	
	F12	465	463	455	447	447	446	441	437	430	423	423	423	387	313	240	183	154	135	99	
	F22/WC9	465	465	464	458	451	449	447	446	442	438	438	438	424	384	321	246	207	175	118	
	F91/C12A	465	465	465	465	465	465	465	465	462	454	451	446	424	384	321	281	261	261	257	219
	F316/CF8M	465	457	423	386	358	335	317	310	304	300	295	292	289	287	285	269	261			
3000	A105/WCB	517	517	516	510	505	505	505	501	489	471	434	359								
	F11/WC6	517	517	517	517	517	517	517	517	514	505	502	496	471	427	321	232	186	158	110	
	F12	517	515	506	497	497	495	490	485	478	470	470	470	430	348	267	204	171	150	110	
	F22/WC9	517	517	516	509	502	499	497	495	492	487	487	487	471	427	356	273	230	195	131	
	F91/C12A	517	517	517	517	517	517	517	517	514	505	502	496	471	427	356	312	290	290	285	243
	F316/CF8M	517	508	470	429	398	372	352	344	338	333	328	325	321	319	317	299	290			
3500	A105/WCB	603	603	602	595	590	589	589	584	570	549	506	419								
	F11/WC6	603	603	603	603	603	603	603	603	600	589	585	579	550	498	375	271	217	185	128	
	F12	603	600	590	580	580	578	572	566	558	549	549	549	501	406	311	238	199	175	128	
	F22/WC9	603	603	602	594	585	583	580	578	574	568	568	568	550	498	416	319	268	227	153	
	F91/C12A	603	603	603	603	603	603	603	603	600	589	585	579	550	498	416	365	338	338	333	284
	F316/CF8M	603	592	549	501	464	434	411	402	394	359	383	379	375	373	370	349	338			
4500	A105/WCB	775	775	774	765	758	757	757	751	733	706	651	539								
	F11/WC6	775	775	775	775	775	775	775	775	771	757	753	744	707	641	482	348	279	238	165	
	F12	775	772	759	745	745	743	735	728	717	705	705	705	645	522	400	306	257	225	165	
	F22/WC9	775	775	774	764	753	749	746	743	738	731	731	731	707	641	535	410	345	293	197	
	F91/C12A	775	775	775	775	775	775	775	775	771	757	753	744	707	641	535	469	435	435	428	365
	F316/CF8M	775	762	706	644	597	558	529	517	507	500	492	487	482	480	475	448	435			