



SAPAG STEAM SAFETY VALVE

SERIES 9100

High performance safety valve for the protection of large boilers and superheaters, certified to ASME Section I



FEATURES

- National Board Certified to ASME I (3% overpressure, 2 to 4% adjustable blowdown)
- A true main steam valve for boilers and superheaters
- Butt welded (BW) or flanged inlet
- Hard faced seat
- 2 adjusting rings
- Thermally balanced disc
- MONEL piston and guide
- Disc loaded at seat level
- Factory setting on steam

CONDITIONS OF DELIVERY

Series 9100 are delivered either in flanged or BW end version; in case of BW version, the valves are shipped with the hydraulic test plug in place instead of the disc which is packed separately. Flanged valves are shipped in as-set condition. Valves to be stamped with the "V" ASME I Code symbol stamp and those for which it is mentioned in the Purchase Order, will be set on saturated steam if the operating characteristics are within the capability of the boiler at the factory. If not, the valves will be set on dry air and a site adjustment shall have to be carried out by factory agreement. The valves are painted with an aluminium high temperature layer.

GENERAL

Product presentation and performance

The series 9100 is a high capacity Safety Valve designed for the overpressure protection of high pressure steam boilers and superheaters. It has been designed to meet the requirements of the ASME Code Section I, Power Boilers, and is National Board certified according to the Code rules.

The "V" Code symbol stamp may be applied to this valve.

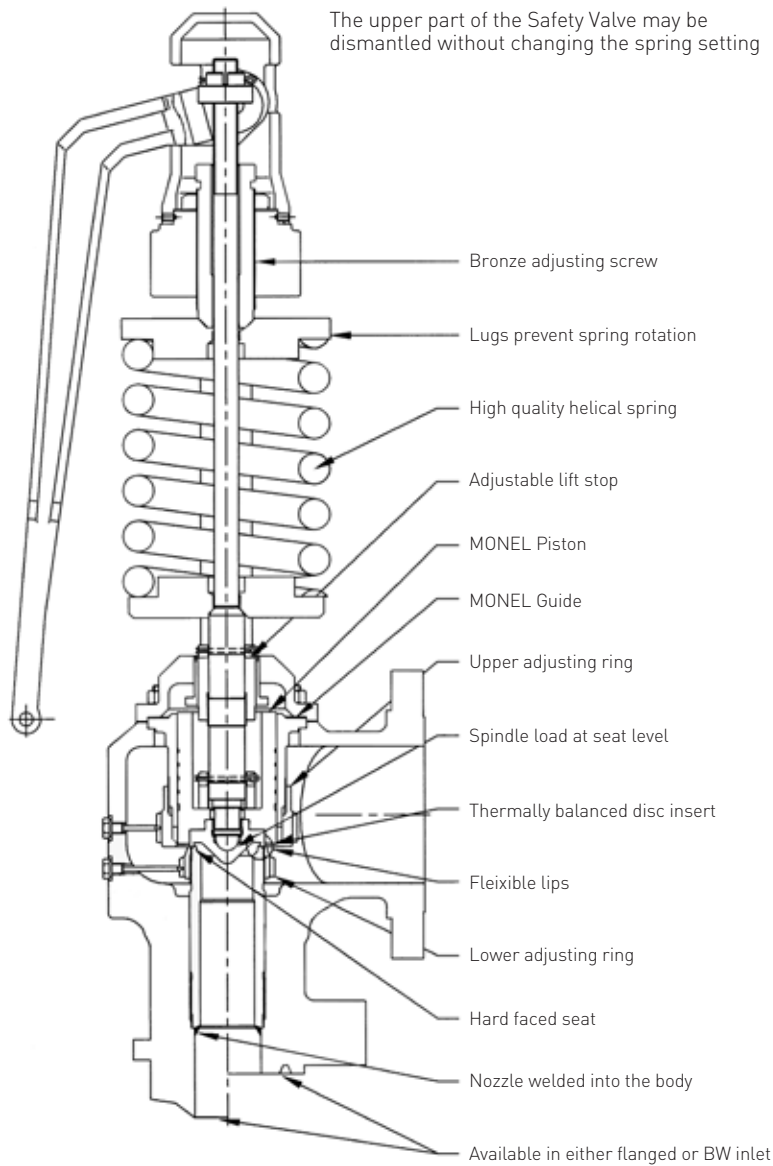
The double adjusting ring control provides a sharp opening with minimum warn, full lift at no more than 3% over pressure and a blowdown adjustable to 2-4% of the set pressure.

This safety valve has a disc designed to enhance the precision of the set point (± 0.7 bar up to 70 bar, $\pm 1\%$ of the set pressure and beyond).

TECHNICAL DATA

Size:	NPS 1½ to 8 inlet
Orifice:	2.85 cm ² to 129.3 cm ²
Set pressure:	up to 210 bar
Temperature:	up to 593°C.

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / MAIN FEATURES - PRODUCT DESCRIPTION



GENERAL CHARACTERISTICS

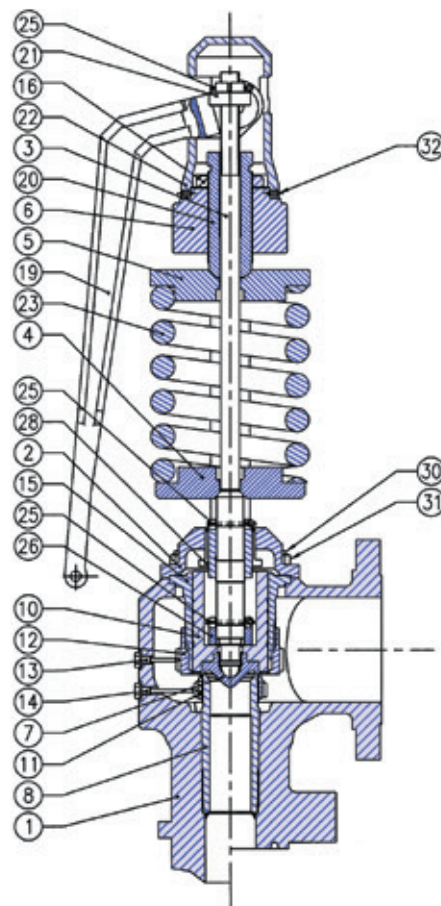
- Inlet can be either BW or flanged.
- The nozzle is welded into the body in order to provide greater seat tightness.
- The nozzle seat is stellite to prevent erosion and wear, thus reducing maintenance costs and improving seat tightness.
- The lower adjusting ring provides a sharp opening without simmer.
- The disc is designed with flexible lips to improve seat tightness under pressure. Due to the thermo-balanced design it takes advantage of the materials thermal expansion to increase the specific pressure of the disc onto its seat.
- The loading point of the spindle on the disc is at to the seat level to provide a superior set pressure tolerance.
- The upper adjusting ring allows an accurate opening/closing cycle of the valve.
- The sliding surfaces are in MONEL to maintain good guiding properties at high temperature.
- The spindle guide is stellite to avoid any risk of galling.
- The bronze adjusting screw minimizes the torque when setting the valve.
- Lugs prevent the spring from rotating during setting.
- The complete top of valve including piston, guide and spring assembly may be removed from the valve body without changing the spring setting, in order to insert the hydraulic plug in lieu of the disc for test or maintenance purpose.

SAPAG STEAM SAFETY VALVE

SERIES 9100 / MATERIALS AND CONSTRUCTION

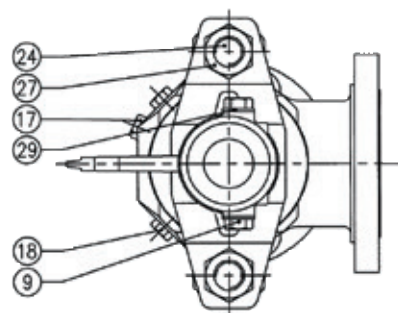
MATERIAL SELECTION

Item	Designation	9100-WCB	9100-WC9
1	Body	SA 216 WCB	SA 217 WC9
2	Bonnet	SA 216 WCB+ Stellite	SA 216 WCB+ Stellite
3	Spindle	Stainless steel	Stainless steel
4	L.spring washer	Carbon steel	Carbon steel
5	U.spring washer	Carbon steel	Carbon steel
6	Yoke	SA 216 WCB	SA 216 WCB
7	Disc	A565 gr 616	A565 gr 616
8	Nozzle	347 ss. Stellite	347 ss. Stellite
9	Lever axle	Carbon steel	Carbon steel
10	Piston	MONEL S	MONEL S
11	Lower adj.ring	Stainless steel	Stainless steel
12	Upper adj.ring	Stainless steel	Stainless steel
13	U.ring set screw	Stainless steel	Stainless steel
14	L.ring set screw	Stainless steel	Stainless steel
15	Guide	MONEL S	MONEL S
16	Hex nut	Carbon steel	Carbon steel
17	Drain plug	Carbon steel	Carbon steel
18	Plug	Carbon steel	Carbon steel
19	Lever	Carbon steel	Carbon steel
20	Adjusting screw	Bronze	Bronze
21	Spindle nut	Stainless steel	Stainless steel
22	Cap	Cast steel	Cast steel
23	Spring	Alloy steel	High temp.alloy
24	Yoke rod	SA 193 B7	SA 193 B16
25	Pin	Stainless steel	Stainless steel
26	Stem nut	Stainless steel	Stainless steel
27	Yoke rod nut	SA 194 gr 2H	SA 194 gr 2H
28	Stop collar	Stainless steel	Stainless steel
29	Lock washer	Carbon steel	Carbon steel
30	Bonnet stud	Carbon steel	Carbon steel
31	Bonnet nut	Carbon steel	Carbon steel
32	Cap screw	Carbon steel	Carbon steel



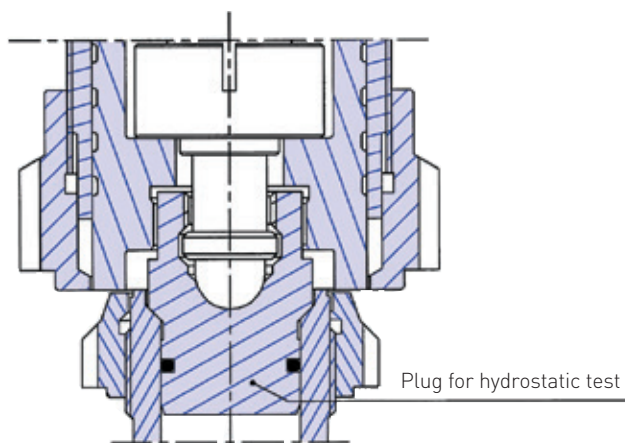
MATERIALS AND CONSTRUCTION

The valve body is SA216 WCB carbon steel (designation 9100-WCB) up to 400°C/750°F and SA217 WC9 2.5% Chromium alloy steel (designation 9100-WC9) up to 595°C/1100°F. The disc is machined from a heat treated, high strength, wear resistant martensitic stainless steel, suitable for the more severe conditions. The nozzle uses an austenitic stainless steel stabilised with Niobium, and the seat is hard faced. MONEL S castings are used for guiding parts. The spring is made from superior quality, high temperature alloy steel. The grade is selected according to the service conditions.

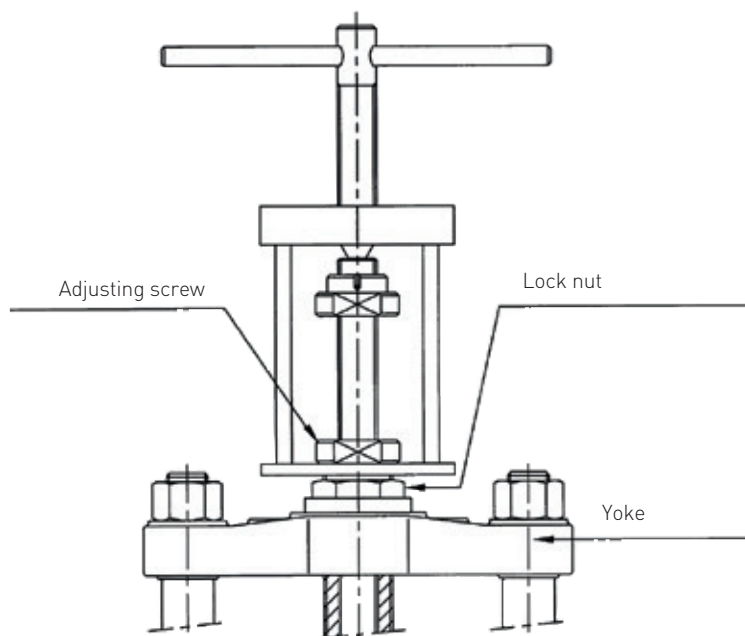


SAPAG STEAM SAFETY VALVE

SERIES 9100 / ACCESSORIES



LOCKING GAG



The 9100 safety valves are delivered with an hydrostatic test plug. This plug has to be fitted in lieu of the disc if it is required to hydrotest the boiler with the safety valves in place. It is also recommended to let this plug in the valve when welding the BW on the boiler outlet nozzle. The hydrostatic test plug has to be used together with the locking gag fixture. The purpose of this fixture is to maintain the spindle of the valve in the closed position.

Weather shield is also available for spring protection.

Lapping tools are available for seat reconditioning.

SAPAG STEAM SAFETY VALVE

SERIES 9100 / SAFETY VALVE SELECTION

SIZING

The safety valve is defined by its orifice size. The orifice sizes are designated by figures corresponding to orifice areas between 2.85 cm² / 0,44 sq.in. and 129.3 cm² / 20 sq.in.

Orifice	-0	-1	-2	-3	-4	-5	-8	-6	-7	-9
cm ²	2.85	6.40	9.25	16.50	25.30	45.80	47.48	71.20	103.25	129.30
in ²	0.44	0.99	1.43	2.56	4.00	7.10	7.36	11.03	16.00	20.00

Knowing the required flow capacity of the valve at the desired set pressure, the orifice size can be determined either by using the capacity tables on pages 9 to 12 (kg/h) or Pages 13 to 16 (lbs/hr) or by calculation:

Metric units:

$$A \geq \frac{q_m}{52.5 \times P \times K_D \times K_A \times K_{SH} \times K_N}$$

US customary units:

$$A \geq \frac{q_m}{51.45 \times P \times K_D \times K_A \times K_{SH} \times K_N}$$

where:

Symbol	Designation	Metric unit	US customary
A	Orifice area	cm ²	sq.in.
q _v	Valve flow rate	kg/h	lbs/hr
q _m	Required flow rate	kg/h	lbs/hr
P	Relieving pressure, abs.	bar abs	psia
α	Overpressure	%	%
SP	Set pressure	bar	psig
K _D	Discharge coefficient	0.938	0.938
K _A	Derating coefficient	0.9	0.9
K _{SH}	Superheat correction factor	Table 4	Table 4
K _N	Napier coefficient		

P = Set Pressure + Overpressure + Atmospheric Pressure

$$P = \left(1 + \frac{\alpha}{100} \right) \times SP + 1.013 \quad (\text{bar abs.}) \quad \text{or} \quad P = \left(1 + \frac{\alpha}{100} \right) \times SP + 14.7 \quad (\text{psia})$$

α = overpressure, 3% (ASME Section I) or 10% (according to regulation)

K_{SH} = obtained from page 17 for superheated steam

K_{cH} = 1.00 for saturated steam

K_N = NAPIER correction factor

K_N = 1.00 for up to 103 bar/1500 psig

beyond:

$$K_N = \frac{2.7644 \times P - 1000}{3.3242 \times P - 1061} \quad (\text{metric})$$

$$K_N = \frac{0.1906 \times P - 1000}{0.2292 \times P - 1061} \quad (\text{US customary})$$

Valve flow rate:

$$q_v = 52.5 \times A \times P \times K_D \times K_A \times K_{SH} \times K_N \quad (\text{metric})$$

$$q_v = 51.45 \times A \times P \times K_D \times K_A \times K_{SH} \times K_N \quad (\text{US customary})$$

PRESSURE/TEMPERATURE RATING

When the orifice size has been selected, refer to page 8 to select the correct valve rating corresponding to the orifice size, the set pressure and the temperature.

Pressure ratings are based on ASME B16.34.

- type 9104 = Cl. 600 lbs

- type 9105-6 = Cl. 900 lbs

- type 9107 = Cl. 1500 lbs

- type 9108 = Cl. 2500 lbs

- type 9109 = Cl. 3000 lbs

DIMENSIONS AND WEIGHTS

Refer to page 7 for dimensional data and valve inlet x outlet sizes.

SAPAG STEAM SAFETY VALVE

SERIES 9100 / TECHNICAL INFORMATION

SELECTION GUIDE

Example:	9106	-3	WC9	2½" 900 RF	21/2" 900 RF
Type					
9104	Cl. 600 lbs				
9105-6	Cl. 900 lbs				
9107	Cl. 600 lbs				
9108	Cl. 600 lbs				
9109	Cl. 600 lbs				
Orifice					
-0	2.85 cm ² (0.44 sq.in)				
-1	6.40 cm ² (0.99 sq.in)				
-2	9.25 cm ² (1.43 sq.in)				
-3	16.50 cm ² (2.56 sq.in)				
-4	25.30 cm ² (4.00 sq.in)				
-5	45.80 cm ² (7.10 sq.in)				
-6	71.20 cm ² (11.03 sq.in)				
-7	103.25 cm ² (16.00 sq.in)				
-9	129.30 cm ² (20.00 sq.in)				
Material and temperature					
WCB	T ≤ 400°C / 750°F				
WC9	T ≤ 595°C / 1100°F				
Inlet					
Size, rating and finish					
Outlet					
Size, rating and finish					

NOISE

The noise generated by the safety valve when discharging can be evaluated by the following formula.

Values for saturated steam are given on page 18.

The absorption of an exhaust pipe sch40 will be approximately -20 dB(A).

At a distance of 30 m, consider -30 dB(A).

$$\text{Sound} = 14 \log_{10} (0.963A) + 18 \log_{10} P_1 + 76$$

REACTION FORCE

The reaction force generated by a safety valve when discharging can be evaluated by the following formula.

Values for saturated steam are published on page 18.

$$F = \frac{q_v}{1563} \sqrt{T + 0.1 \times P \times S}$$

with

- T Absolute temperature (°K)
- q_v Valve flow rate (kg/h)
- P Relieving pressure (bar abs)
- S Area of valve outlet (cm²)
- F Reaction force (daN)

INSTALLATION

The boiler outlet nozzle shall have a cross section which is at least equal to the cross section of the inlet size of the safety valve.

The pressure drop between the header and any safety valve must be minimum, and in no circumstance be more than 3% of the set pressure when the valve is discharging its rated capacity.

The design of the boiler outlet nozzle should take into consideration the unbalanced reaction force generated by the safety valve when discharging; See above for reaction force evaluation.

The exhaust piping shall be simple and direct. Care shall be taken to relief at a safe location.

The exhaust piping shall be equal or larger than the safety valve outlet.

The exhaust pipe shall be drained to avoid accumulation of condensate or rain water in the safety valve body.

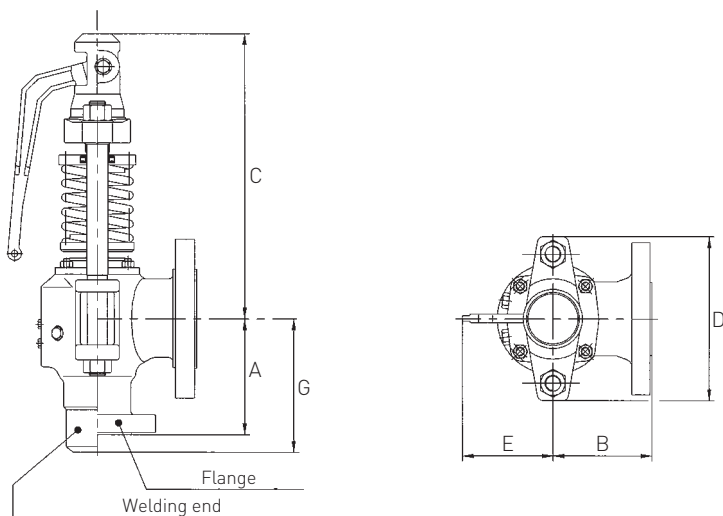
The drain hole in the body wall should be piped to a drain line.

The exhaust piping shall be designed in such a way that no stress from pipe thermal expansion or misalignment is transmitted to the valve body.

The exhaust piping should be of a simple design, using large radius elbow, flexible joint and drip pan.

SAPAG STEAM SAFETY VALVE

SERIES 9100 / DIMENSIONS AND WEIGHTS



TYPE 9100 DIMENSIONS AND WEIGHTS

	Model N°	Inlet NPS	Inlet class (lbs)	Outlet NPS	Outlet class (lbs)	A mm	B mm	C mm	D mm	E mm	G mm	W kg
Orifice 0 2.85 cm ² 0.44 in ²	9104	1½	600	3	150	171	137	510	232	130	185	45
	9106	1½	900	3	150	181	137	510	232	130	185	48
	9107	1½	1500	3	300	181	137	510	232	130	185	48
	9108	1½	2500	3	300	190	137	510	232	130	185	52
	9109	1½	BW	3	300		137	510	232	130	185	45
Orifice 1 6.40 cm ² 0.99 in ²	9104	1½	600	3	150	171	137	510	232	130	185	45
	9106	1½	900	3	150	181	137	545	232	130	185	48
	9107	1½	1500	3	300	181	137	500	232	130	185	48
	9108	1½	2500	4	300	220	165	552	260	130	215	87
	9109	1½	BW	4	300		165	552	260	130	215	84
Orifice 2 9.25 cm ² 1.43 in ²	9104	2	600	4	150	207	170	640	260	130	155	85
	9106	2	900	4	150	220	170	640	260	130	155	85
	9107	2	1500	4	300	220	170	670	260	130	155	87
	9108	2	2500	4	300	230	177	680	330	200	155	93
	9109	2	BW	4	300		177	680	330	200	190	90
Orifice 3 16.5 cm ² 2.56 in ²	9104	2½	600	6	150	215	179	730	330	200	185	111
	9106	2½	900	6	150	228	179	730	330	200	185	116
	9107	2½	1500	6	300	228	179	765	330	200	185	116
	9108	2½	2500	6	300	275	200	776	415	200	220	184
	9109	2½	BW	6	300		200	776	415	200	220	180
Orifice 4 25.8 cm ² 4.00 in ²	9104	3	600	6	150	251	188	815	415	200	300	175
	9106	3	900	6	150	257	188	865	415	200	300	176
	9107	3	1500	6	150	266	188	940	415	200	300	184
	9108	3	2500	6	300	284	218	1020	422	245	300	229
	9109	3	BW	6	300		200	1020	422	245	300	218
Orifice 5 45.8 cm ² 7.10 in ²	9104	4	600	6	150	251	212	900	415	200	310	254
	9106	4	900	6	150	257	212	900	415	200	310	255
	9107	4	1500	6	150	266	212	1030	422	245	310	275
Orifice 8 47.48 cm ² 7.36 in ²	9109	4	BW	8	300		270	1190	510	245	330	560
Orifice 6 71.20 cm ² 11.03 in ²	9104	6	600	8	150	301	260	1130	510	245	340	355
	9106	6	900	8	150	308	260	1200	510	245	340	360
	9107	6	1500	8	150	335	260	1200	510	245	340	390
Orifice 7 103.25 cm ² 16.00 in ²	9104	6	600	10	150	382	267	1230	568	245	390	550
	9105	6	900	10	150	390	267	1230	568	245	390	560
Orifice 9 129.3 cm ² 20.00 in ²	9104	8	600	10	150	309	260	1200	510	240	290	373
	9105	8	900	10	150	316	260	1220	510	246	290	382

BW = Butt weld

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / PRESSURE TEMPERATURE RATINGS

ORIFICE 0 - 1 - 2 / MAX. SET PRESSURE: bar, psig

Body	Temp.		Valve type number									
	°C	°F	9104		9106		9107		9108		9109	
			bar	psig	bar	psig	bar	psig	bar	psig	bar	psig
SA 216 WCB	316	600	76	1095	113	1640						
	343	650	74	1075	111	1610	185	2685				
	371	700	73	1065	110	1600	184	2665	207	3000	207	3000
	399	750	70	1010	104	1510	174	2520	207	3000	207	3000
SA 217 WC9	427	800	70	1015	105	1525	175	2540	207	3000	207	3000
	454	850	67	975	101	1460	168	2435	207	3000	207	3000
	482	900	62	900	93	1350	155	2245	207	3000	207	3000
	510	950	52	755	78	1130	130	1885	207	3000	207	3000
	538	1000	36	520	54	780	90	1305	150	2170	162	2355
	566	1050	24	350	36	525	60	875	100	1455	121	1750
	593	1100	15	220	23	330	38	550	63	915	76	1098

ORIFICE 3 - 4 / MAX. SET PRESSURE: bar, psig

Body	Temp.		Valve type number									
	°C	°F	9104		9106		9107		9108		9109	
			bar	psig	bar	psig	bar	psig	bar	psig	bar	psig
SA 216 WCB	≤ 399	≤ 750	67	975	101	1460	168	2435	180	2610	207	3000
SA 217 WC9	427	800	67	975	101	1460	168	2435	180	2610	207	3000
	454	850	67	975	101	1460	168	2435	180	2610	207	3000
	482	900	62	900	93	1350	155	2245	180	2610	207	3000
	510	950	52	755	78	1130	130	1885	180	2610	207	3000
	538	1000	36	520	54	780	90	1305	150	2170	162	2355
	566	1050	24	350	36	525	60	875	100	1455	121	1750
	593	1100	15	220	23	330	38	550	63	915	76	1098

ORIFICE 5 - 7 / MAX. SET PRESSURE: bar, psig

Body	Temp.		Valve type number					
	°C	°F	9104		9106		9107	
			bar	psig	bar	psig	bar	psig
SA 216 WCB	≤ 399	≤ 750	67	975	79	1150	109	1580
SA 217 WC9	427	800	67	975	79	1150	109	1580
	454	850	67	975	79	1150	109	1580
	482	900	62	900	79	1150	109	1580
	510	950	52	755	78	1130	109	1580
	538	1000	36	520	54	780	90	1305
	566	1050	24	350	36	525	60	875
593	1100	15	220	23	330	38	550	

ORIFICE 8 / MAX. SET PRESSURE: bar, psig

Body	Temp.		Valve type number	
	°C	°F	9109	
			bar	psig
SA 216 WCB	≤ 399	≤ 750	207	3000
SA 217 WC9	427	800	207	3000
	454	850	207	3000
	482	900	207	3000
	510	950	207	3000
	538	1000	162	2355
	566	1050	121	1750
	593	1100	76	1098

ORIFICE 7 - 9 / MAX. SET PRESSURE: bar, psig

Body	Temp.		Valve type number			
	°C	°F	9104		9105	
			bar	psig	bar	psig
SA 216 WCB	≤ 399	≤ 750	40	580	57	820
SA 217 WC9	427	800	40	580	57	820
	454	850	40	580	57	820
	482	900	40	580	57	820
	510	950	40	580	57	820
	538	1000	36	520	45	650
	566	1050	24	350	30	438
	593	1100	15	220	19	275

SAPAG STEAM SAFETY VALVE

SERIES 9100 / CAPACITY METRIC UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (kg/h)

Set pressure [bar]	Relieving pressure [bar abs]	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
		Area (cm ²) A									
		2.85	6.4	9.25	16.5	25.8	45.8	47.48	71.2	103.25	129.3
		Kg/h									
30	32	4035	9062	13097	23362	36530	64849	67227	100813	146193	183077
31	33	4166	9354	13520	24117	37709	66942	69397	104066	150911	188986
32	34	4296	9647	13943	24871	38888	69035	71567	107320	155629	194895
33	35	4426	9939	14365	25625	40068	71128	73737	110574	160348	200803
34	36	4556	10232	14788	26379	41247	73221	75906	113828	165066	206712
35	37	4687	10524	15211	27133	42426	75314	78076	117081	169784	212621
36	38	4817	10817	15633	27887	43605	77407	80246	120335	174503	218530
37	39	4947	11109	16056	28641	44784	79500	82416	123589	179221	224439
38	40	5077	11402	16479	29395	45963	81593	84586	126843	183940	230348
39	41	5208	11694	16902	30149	47142	83686	86755	130096	188658	236257
40	42	5338	11987	17324	30903	48321	85779	88925	133350	193376	242165
41	43	5468	12279	17747	31657	49500	87872	91095	136604	198095	248074
42	44	5598	12571	18170	32411	50679	89965	93265	139858	202813	253983
43	45	5728	12864	18592	33165	51858	92058	95434	143111	207532	259892
44	46	5859	13156	19015	33919	53037	94151	97604	146365	212250	265801
45	47	5989	13449	19438	34673	54216	96244	99774	149619	216968	271710
46	48	6119	13741	19861	35427	55395	98337	101944	152873	221687	277619
47	49	6249	14034	20283	36181	56574	100430	104114	156126	226405	283527
48	50	6380	14326	20706	36935	57753	102523	106283	159380	231124	289436
49	51	6510	14619	21129	37689	58932	104616	108453	162634	235842	295345
50	53	6640	14911	21551	38443	60111	106709	110623	165888	240560	301254
51	54	6770	15204	21974	39197	61290	108802	112793	169141	245279	307163
52	55	6901	15496	22397	39951	62469	110895	114962	172395	249997	313072
53	56	7031	15789	22820	40705	63648	112988	117132	175649	254716	318981
54	57	7161	16081	23242	41459	64827	115081	119302	178903	259434	324889
55	58	7291	16374	23665	42213	66006	117174	121472	182156	264152	330798
56	59	7422	16666	24088	42967	67185	119267	123642	185410	268871	336707
57	60	7552	16959	24510	43721	68364	121360	125811	188664	273589	342616
58	61	7682	17251	24933	44475	69543	123453	127981	191918		
59	62	7812	17544	25356	45229	70722	125546	130151	195171		
60	63	7943	17836	25779	45983	71901	127639	132321	198425		
61	64	8073	18128	26201	46737	73080	129732	134490	201679		
62	65	8203	18421	26624	47491	74259	131825	136660	204933		
63	66	8333	18713	27047	48245	75438	133918	138830	208187		
64	67	8464	19006	27469	48999	76617	136011	141000	211440		
65	68	8594	19298	27892	49754	77796	138104	143170	214694		
66	69	8724	19591	28315	50508	78975	140197	145339	217948		
67	70	8854	19883	28738	51262	80154	142290	147509	221202		
68	71	8985	20176	29160	52016	81334	144383	149679	224455		
69	72	9115	20468	29583	52770	82513	146476	151849	227709		
70	73	9245	20761	30006	53524	83692	148569	154018	230963		
71	74	9375	21053	30428	54278	84871	150662	156188	234217		
72	75	9505	21346	30851	55032	86050	152755	158358	237470		
73	76	9636	21638	31274	55786	87229	154848	160528	240724		
74	77	9766	21931	31697	56540	88408	156941	162698	243978		
75	78	9896	22223	32119	57294	89587	159034	164867	247232		
76	79	10026	22516	32542	58048	90766	161127	167037	250485		
77	80	10157	22808	32965	58802	91945	163220	169207	253739		
78	81	10287	23100	33387	59556	93124	165313	171377	256993		
79	82	10417	23393	33810	60310	94303	167406	173546	260247		
80	83	10547	23685	34233	61064	95482	169499	175716	263500		
81	84	10678	23978	34656	61818	96661	171592	177886	266754		
82	85	10808	24270	35078	62572	97840	173685	180056	270008		

To obtain capacity at 10% overpressure multiply by $[(1.1 \times SP + 1.013)/(1.03 \times SP + 1.013)]$

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / CAPACITY METRIC UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (kg/h) (CONTINUED)

Set pressure [bar]	Relieving pressure [bar abs]	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
Area (cm ²) A											
Kg/h											
2.85	6.4	9.25	16.5	25.8	45.8	47.48	71.2	103.25	129.3		
83	87	10938	24563	35501	63326	99019	175778	182226	273262		
84	88	11068	24855	35924	64080	100198	177871	184395	276515		
85	89	11199	25148	36346	64834	101377	179964	186565	279769		
86	90	11329	25440	36769	65588	102556	182057	188735	283023		
87	91	11459	25733	37192	66342	103735	184150	190905	286277		
88	92	11589	26025	37615	67096	104914	186243	193074	289530		
89	93	11720	26318	38037	67850	106093	188336	195244	292784		
90	94	11850	26610	38460	68604	107272	190429	197414	296038		
91	95	11980	26903	38883	69358	108451	192522	199584	299292		
92	96	12110	27195	39305	70112	109630	194615	201754	302545		
93	97	12241	27488	39728	70866	110809	196708	203923	305799		
94	98	12371	27780	40151	71620	111988	198801	206093	309053		
95	99	12501	28073	40574	72374	113167	200894	208263	312307		
96	100	12631	28365	40996	73128	114346	202987	210433	315560		
97	101	12762	28657	41419	73882	115525	205080	212602	318814		
98	102	12892	28950	41842	74637	116704	207173	214772	322068		
99	103	12961	29106	42067	75039	117334	208290	215931	323805		
100	104	13101	29420	42522	75849	118601	210539	218262	327301		
101	105	13241	29735	42977	76661	119870	212793	220599	330805		
102	106	13382	30051	43433	77475	121143	215052	222940	334316		
103	107	13523	30367	43890	78291	122418	217316	225287	337836		
104	108	13664	30684	44348	79108	123696	219585	227639	341363		
105	109	13806	31002	44808	79927	124977	221859	229997	344898		
106	110	13947	31321	45268	80748	126261	224138	232360	348442		
107	111	14090	31640	45729	81572	127548	226423	234728	351993		
108	112	14232	31960	46192	82397	128838	228713	237102	355554		
109	113	14375	32281	46656	83224	130131	231008	239482	359122		
110	114	14518	32602	47120	84053	131428		241868			
111	115	14662	32925	47586	84884	132727		244259			
112	116	14806	33248	48053	85717	134030		246657			
113	117	14950	33572	48522	86552	135336		249060			
114	118	15095	33897	48991	87389	136645		251470			
115	119	15240	34222	49462	88229	137958		253886			
116	120	15385	34549	49934	89071	139274		256308			
117	122	15531	34876	50407	89915	140594		258737			
118	123	15677	35204	50881	90761	141917		261172			
119	124	15823	35533	51357	91610	143244		263614			
120	125	15970	35863	51834	92461	144547		266062			
121	126	16118	36194	52312	93314	145909		268518			
122	127	16266	36526	52792	94170	147247		270980			
123	128	16414	36859	53273	95028	148589		273450			
124	129	16563	37193	53756	95888	149935		275926			
125	130	16712	37528	54240	96752	151284		278410			
126	131	16861	37864	54725	97617	152638		280902			
127	132	17011	38201	55212	98486	153996		283401			
128	133	17162	38538	55700	99357	155358		285907			
129	134	17313	38877	56190	100231	156725		288422			
130	135	17464	39217	56681	101107	158095		290944			
131	136	17616	39559	57174	101987	159470		293475			
132	137	17768	39901	57669	102869	160850		296013			
133	138	17921	40244	58165	103754	162234		298561			
134	139	18075	40589	58663	104642	163622		301116			
135	140	18228	40934	59163	105533	165016		303680			

To obtain capacity at 10% overpressure multiply by [(1.1 x SP+1.013)/(1.03 x SP + 1.013)]

SAPAG STEAM SAFETY VALVE

SERIES 9100 / CAPACITY METRIC UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (kg/h) (CONTINUED)

Set pressure [bar]	Relieving pressure [bar abs]	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
		Area (cm ²) A									
		2.85	6.4	9.25	16.5	25.8	45.8	47.48	71.2	103.25	129.3
		Kg/h									
136	141	18383	41281	59664	106428	166414		306253			
137	142	18538	41629	60167	107325	167817		308835			
138	143	18693	41978	60672	108225	169225		311426			
139	144	18850	42329	61178	109129	170638		314026			
140	145	19006	42681	61687	110036	172056		316636			
141	146	19163	43034	62197	110946	173479		319255			
142	147	19321	43388	62709	111860	174908		321884			
143	148	19480	43744	63223	112777	176342		324523			
144	149	19639	44101	63739	113697	177781		327173			
145	150	19798	44459	64258	114622	179226		329832			
146	151	19959	44819	64778	115549	180677		332502			
147	152	20119	45180	65300	116481	182134		335183			
148	153	20281	45543	65824	117416	183596		337874			
149	154	20443	45908	66351	118355	185065		340577			
150	156	20606	46273	66879	119299	186540		343291			
151	157	20770	46641	67410	120246	188021		346016			
152	158	20934	47010	67944	121197	189508		348753			
153	159	21099	47380	68479	122152	191002		351502			
154	160	21265	47752	69017	123112	192502		354264			
155	161	21431	48126	69558	124076	194009		357038			
156	162	21599	48502	70101	125044	195524		359824			
157	163	21767	48879	70646	126017	197045		362623			
158	164	21935	49258	71194	126994	198573		365436			
159	165	22105	49639	71744	127976	200109		368262			
160	166	22275	50022	72298	128963	201652		371102			
161	167	22447	50407	72854	129955	203202		373956			
162	168	22619	50793	73412	130952	204761		376824			
163	169	22792	51182	73974	131954	206327		379706			
164	170	22966	51573	74538	132960	207902		382604			
165	171	23141	51965	75106	133973	209484		385516			
166	172	23316	52360	75676	134990	211076		388445			
167	173	23493	52757	76250	136013	212675		391389			
168	174	23671	53156	76827	137042	214284		394349			
169	175	23850	53557	77407	138077	215901		397326			
170	176	24029	53960	77990	139117	217528		400319			
171	177	24210	54366	78576	140163	219164		403330			
172	178	24392	54775	79166	141216	220810		406359			
173	179	24575	55185	79760	142274	222465		409405			
174	180	24759	55598	80357	143339	224131		412470			
175	181	24944	56014	80958	144411	225807		415554			
176	182	25130	56432	81562	145489	227493		418657			
177	183	25317	56853	82171	146575	229189		421780			
178	184	25506	57277	82783	147667	230897		424923			
179	185	25696	57703	83399	148766	232616		428086			
180	186	25887	58133	84020	149873	234347		431271			
181	187	26080	58565	84644	150987	236089		434477			
182	188	26273	59000	85273	152109	237843		437705			
183	190	26468	59438	85907	153239	239610		440956			
184	191	26665	59879	86544	154376	241389		444230			
185	192	26863	60324	87187	155522	243181		447528			
186	193	27062	60772	87834	156677	244986		450850			
187	194	27263	61223	88486	157840	246804		454197			
188	195	27466	61677	89143	159012	248637		457569			

To obtain capacity at 10% overpressure multiply by $[(1.1 \times SP + 1.013) / (1.03 \times SP + 1.013)]$

SAPAG STEAM SAFETY VALVE

SERIES 9100 / CAPACITY METRIC UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (kg/h) (CONTINUED)

Set pressure (bar)	Relieving pressure (bar abs)	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
Area (cm ²) A											
Kg/h											
		2.85	6.4	9.25	16.5	25.8	45.8	47.48	71.2	103.25	129.3
189	196	27670	62136	89805	160193	250484		460968			
190	197	27875	62597	90473	161383	252345		464393			
191	198	28083	63063	91145	162583	254221		467846			
192	199	28292	63532	91823	163793	256113		471327			
193	200	28502	64005	92507	165013	258020		474837			
194	201	28715	64482	93197	166243	259944		478377			
195	202	28929	64963	93892	167484	261884		481947			
196	203	29145	65449	94594	168735	263841		485549			
197	204	29363	65939	95302	169998	265815		489183			
198	205	29583	66433	96016	171272	267808		492849			
199	206	29806	66932	96737	172558	269819		496550			
200	207	30030	67435	97465	173856	271848		500285			
201	208	30256	67944	98200	175167	273898		504056			
202	209	30485	68457	98942	176490	275967		507864			
203	210	30716	68975	99691	177827	278056		511710			
204	211	30949	69499	100448	179177	280167		515595			
205	212	31184	70028	101212	180541	282300		519520			
206	213	31422	70563	101985	181919	284455		523486			
207	214	31663	71103	102766	183312	286633		527494			
208	215	31906	71649	103555	184720	288835		531546			
209	216	32152	72201	104353	186144	291061		535643			
210	217	32401	72760	105161	187584	293313		539787			

To obtain capacity at 10% overpressure multiply by [(1.1 x SP+1.013)/(1.03 x SP + 1.013)]

SAPAG STEAM SAFETY VALVE

SERIES 9100 / CAPACITY US CUSTOMARY UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (lbs/hr)

Set pressure (psig)	Relieving pressure (psia)	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
Area (in ²) A											
Lbs/hr											
0.44 0.99 1.43 2.56 4 7.1 7.36 11.03 16 20											
435	463	8853	19919	28772	51509	80482	142856	148087	221930	321929	402411
450	478	9139	20562	29701	53171	83080	147467	152867	229092	332319	415399
464	493	9424	21205	30630	54833	85677	152077	157646	236255	342709	428386
479	508	9710	21848	31558	56496	88275	156688	162426	243418	353099	441374
493	522	9996	22491	32487	58158	90872	161298	167205	250580	363489	454361
508	537	10282	23134	33415	59821	93470	165909	171984	257743	373879	467349
522	552	10567	23777	34344	61483	96067	170519	176764	264906	384269	480337
537	567	10853	24420	35273	63145	98665	175130	181543	272068	394659	493324
551	582	11139	25062	36201	64808	101262	179741	186323	279231	405049	506312
566	597	11425	25705	37130	66470	103860	184351	191102	286394	415440	519299
580	612	11710	26348	38059	68133	106457	188962	195882	293556	425830	532287
595	627	11996	26991	38987	69795	109055	193572	200661	300719	436220	545275
609	642	12282	27634	39916	71458	111652	198183	205440	307882	446610	558262
624	657	12567	28277	40844	73120	114250	202794	210220	315044	457000	571250
638	672	12853	28920	41773	74782	116847	207404	214999	322207	467390	584237
653	687	13139	29563	42702	76445	119445	212015	219779	329370	477780	597225
667	702	13425	30206	43630	78107	122043	216625	224558	336532	488170	610213
682	717	13710	30848	44559	79770	124640	221236	229338	343695	498560	623200
696	732	13996	31491	45487	81432	127238	225847	234117	350858	508950	636188
711	747	14282	32134	46416	83094	129835	230457	238897	358020	519340	649175
725	761	14568	32777	47345	84757	132433	235068	243676	365183	529730	662163
740	776	14853	33420	48273	86419	135030	239678	248455	372346	540120	675151
754	791	15139	34063	49202	88082	137628	244289	253235	379508	550510	688138
769	806	15425	34706	50130	89744	140225	248900	258014	386671	560901	701126
783	821	15710	35349	51059	91407	142823	253510	262794	393833	571291	714113
798	836	15996	35991	51988	93069	145420	258121	267573	400996	581681	727101
812	851	16282	36634	52916	94731	148018	262731	272353	408159	592071	740088
827	866	16568	37277	53845	96394	150615	267342	277132	415321	602461	753076
841	881	16853	37920	54774	98056	153213	271953	281911	422484		
856	896	17139	38563	55702	99719	155810	276563	286691	429647		
870	911	17425	39206	56631	101381	158408	281174	291470	436809		
885	926	17710	39849	57559	103043	161005	285784	296250	443972		
899	941	17996	40492	58488	104706	163603	290395	301029	451135		
914	956	18282	41135	59417	106368	166200	295006	305809	458297		
928	971	18568	41777	60345	108031	168798	299616	310588	465460		
943	985	18853	42420	61274	109693	171395	304227	315367	472623		
957	1000	19139	43063	62202	111355	173993	308837	320147	479785		
972	1015	19425	43706	63131	113018	176590	313448	324926	486948		
986	1030	19710	44349	64060	114680	179188	318059	329706	494111		
1001	1045	19996	44992	64988	116343	181785	322669	334485	501273		
1015	1060	20282	45635	65917	118005	184383	327280	339265	508436		
1030	1075	20568	46278	66846	119668	186980	331890	344044	515599		
1044	1090	20854	46921	67774	121330	189578	336501	348824	522761		
1059	1105	21139	47563	68703	122992	192176	341112	353603	529924		
1073	1120	21425	48206	69631	124655	194773	345722	358382	537087		
1088	1135	21710	48849	70560	126317	197371	350333	363162	544249		
1102	1150	21996	49492	71489	127980	199968	354943	367941	551412		
1117	1165	22282	50135	72417	129642	202566	359554	372721	558575		
1131	1180	22568	50778	73346	131304	205163	364165	377500	565737		
1146	1195	22854	51421	74274	132967	207761	368775	382280	572900		
1160	1210	23139	52064	75203	134629	210358	373386	387059	580063		
1175	1224	23425	52707	76132	136292	212956	377996	391838	587225		
1189	1239	23711	53349	77060	137954	215553	382607	396618	594388		

To obtain capacity at 10% overpressure multiply by $[(1.1 \times SP + 14.7) / (1.03 \times SP + 14.7)]$

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / CAPACITY US CUSTOMARY UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (lbs/hr) (CONTINUED)

Set pressure (psig)	Relieving pressure (psia)	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
		Area (in ²) A									
Lbs/hr											
		0.44	0.99	1.43	2.56	4	7.1	7.36	11.03	16	20
1204	1254	23997	53992	77989	139616	218151	387218	401397	601551		
1218	1269	24282	54635	78917	141279	220748	391828	406177	608713		
1233	1284	24568	55278	79846	142941	223346	396439	410956	615876		
1247	1299	24854	55921	80775	144604	225943	401049	415736	623039		
1262	1314	25139	56564	81703	146266	228541	405660	420515	630201		
1276	1329	25425	57207	82632	147929	231138	410270	425294	637364		
1291	1344	25711	57850	83561	149591	233736	414881	430074	644527		
1305	1359	25997	58493	84489	151253	236333	419492	434853	651689		
1320	1374	26282	59135	85418	152916	238931	424102	439633	658852		
1334	1389	26568	59778	86346	154578	241528	428713	444412	666014		
1349	1404	26854	60421	87275	156241	244126	433323	449192	673177		
1363	1419	27140	61064	88204	157903	246723	437934	453971	680340		
1378	1434	27425	61707	89132	159565	249321	442545	458751	687502		
1392	1448	27711	62350	90061	161228	251918	447155	463530	694665		
1407	1463	27997	62993	90989	162890	254516	451766	468309	701828		
1421	1478	28282	63636	91918	164553	257113	456376	473089	708990		
1436	1493	28568	64278	92847	166215	259711	460987	477868	716153		
1450	1508	28854	64921	93775	167877	262309	465598	482648	723316		
1465	1523	29140	65564	94704	169540	264906	470208	487427	730478		
1479	1538	29425	66207	95633	171202	267504	474819	492207	737641		
1494	1553	29711	66850	96561	172865	270101	479429	496986	744804		
1508	1568	29997	67447	97423	174408	272513	483711	501424	751455		
1523	1583	30282	68145	98432	176214	275335	488720	506617	759237		
1537	1598	30598	68846	99444	178025	278164	493741	511821	767037		
1552	1613	30910	69547	100457	179839	280999	498773	517038	774855		
1566	1628	31223	70251	101473	181658	283841	503818	522268	782692		
1581	1643	31536	70956	102492	183482	286690	508875	527509	790547		
1595	1658	31850	71663	103513	185309	289546		532764			
1610	1672	32165	72371	104536	187141	292408		538032			
1624	1687	32481	73081	105562	188978	295278		543312			
1639	1702	32797	73793	106591	190820	298155		548606			
1653	1717	33114	74507	107622	192666	301040		553914			
1668	1732	33433	75223	108656	194516	303932		559235			
1682	1747	33751	75941	109692	196372	306832		564570			
1697	1762	34071	76660	110732	198233	309739		569919			
1711	1777	34392	77382	111774	200099	312654		575283			
1726	1792	34713	78105	112819	201969	315577		580662			
1740	1807	35036	78831	113867	203845	318508		586055			
1755	1822	35359	79558	114917	205726	321447		591463			
1769	1837	35683	80288	115971	207613	324395		596887			
1784	1852	36009	81019	117028	209505	327351		602326			
1798	1867	36335	81753	118088	211402	330316		607781			
1813	1882	36662	82489	119151	213305	333289		613253			
1827	1897	36990	83227	120217	215214	336272		618740			
1842	1911	37319	83968	121287	217128	339263		624244			
1856	1926	37649	84710	122359	219049	342264		629765			
1871	1941	37980	85455	123435	220975	345274		635304			
1885	1956	38312	86203	124515	222908	348293		640859			
1900	1971	38645	86952	125598	224846	351322		646433			
1914	1986	38980	87704	126684	226791	354361		652025			
1929	2001	39315	88459	127774	228742	357410		657635			
1943	2016	39652	89216	128868	230700	360469		663263			
1958	2031	39989	89976	129965	232665	363539		668911			

To obtain capacity at 10% overpressure multiply by [(1.1 x SP+14.7)/(1.03 x SP + 14.7)]

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / CAPACITY US CUSTOMARY UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (lbs/hr) (CONTINUED)

Set pressure (psig)	Relieving pressure (psia)	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
Area (in ²) A											
Lbs/hr											
		0.44	0.99	1.43	2.56	4	7.1	7.36	11.03	16	20
1978	2046	40328	90738	131066	234636	366618		674578			
1987	2061	40668	91503	132171	236614	369709		680265			
2001	2076	41009	92271	133280	238599	372811		685972			
2016	2091	41352	93041	134393	240591	375923		691699			
2030	2106	41695	93814	135509	242590	379047		697447			
2045	2121	42040	94590	136630	244597	382182		703216			
2059	2135	42386	95369	137755	246611	385329		709006			
2074	2150	42734	96151	138885	248633	388488		714818			
2088	2165	43083	96936	140018	250662	391659		720653			
2103	2180	43433	97724	141156	252699	394843		726510			
2117	2195	43784	98515	142299	254745	398039		732391			
2132	2210	44137	99309	143446	256798	401247		738295			
2146	2225	44492	100106	144598	258860	404469		744223			
2161	2240	44847	100907	145754	260931	407704		750175			
2175	2255	45205	101711	146916	263010	410952		756153			
2190	2270	45564	102518	148082	265097	414215		762155			
2204	2285	45924	103329	149253	267194	417491		768184			
2219	2300	46286	104143	150429	269300	420782		774238			
2233	2315	46650	104962	151611	271416	424087		780320			
2248	2330	47015	105783	152798	273541	427407		786429			
2262	2345	47382	106609	153990	275675	430742		792566			
2277	2359	47750	107438	155188	277820	434093		798731			
2291	2374	48121	108271	156392	279974	437460		804926			
2306	2389	48493	109108	157601	282139	440842		811150			
2320	2404	48867	109950	158816	284314	444241		817404			
2335	2419	49242	110795	160037	286501	447657		823689			
2349	2434	49620	111645	161265	288698	451090		830006			
2364	2449	49999	112499	162498	290906	454540		836354			
2378	2464	50381	113357	163738	293125	458008		842736			
2393	2479	50764	114220	164984	295357	461495		849150			
2407	2494	51150	115087	166237	297600	465000		855599			
2422	2509	51538	115960	167497	299855	468523		862083			
2436	2524	51927	116836	168764	302123	472066		868602			
2451	2539	52319	117718	170038	304403	475629		875158			
2465	2554	52713	118605	171318	306696	479212		881751			
2480	2569	53110	119497	172607	309002	482816		888382			
2494	2584	53509	120394	173903	311322	486441		895051			
2509	2598	53910	121297	175206	313656	490087		901761			
2523	2613	54313	122205	176518	316004	493756		908510			
2538	2628	54719	123118	177837	318366	497447		915302			
2552	2643	55128	124037	179165	320743	501160		922135			
2567	2658	55539	124962	180501	323135	504898		929012			
2581	2673	55953	125893	181846	325542	508659		935933			
2596	2688	56369	126830	183199	327965	512446		942900			
2610	2703	56788	127774	184562	330404	516257		949913			
2625	2718	57210	128723	185934	332860	520094		956973			
2639	2733	57635	129680	187315	335333	523958		964082			
2654	2748	58063	130642	188706	337823	527848		971241			
2668	2763	58494	131612	190107	340331	531767		978451			
2683	2778	58928	132589	191518	342857	535714		985713			
2694	2793	59366	133573	192939	345401	539689		993028			
2712	2808	59806	134564	194371	347965	543695		1000399			
2726	2822	60250	135563	195814	350548	547731		1007825			

To obtain capacity at 10% overpressure multiply by $[(1.1 \times SP + 14.7) / (1.03 \times SP + 14.7)]$

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / CAPACITY US CUSTOMARY UNITS

CAPACITY: 3% OVERPRESSURE SATURATED STEAM (lbs/hr) (CONTINUED)

Set pressure (psig)	Relieving pressure (psia)	Size orifice									
		1.5"x3"	1.5"x3" and 4"	2"x4"	2.5"x6"	3"x6"	4"x6"	4"x8"	6"x8"	6"x10"	8"x10"
		Orifice									
		0	1	2	3	4	5	8	6	7	9
Area (in ²) A											
Lbs/hr											
		0.44	0.99	1.43	2.56	4	7.1	7.36	11.03	16	20
2741	2837	60698	136570	197268	353151	551798		1015309			
2755	2852	61149	137585	198733	355775	555898		1022852			
2770	2867	61603	138607	200211	358419	560030		1030455			
2784	2882	62062	139639	201700	361085	564196		1038121			
2799	2897	62524	140678	203202	363774	568397		1045850			
2813	2912	62990	141727	204716	366485	572633		1053644			
2828	2927	63460	142784	206244	369219	576905		1061506			
2842	2942	63934	143851	207784	371978	581215		1069436			
2857	2957	64412	144927	209339	374761	585564		1077437			
2871	2972	64895	146013	210908	377569	589951		1085511			
2886	2987	65382	147109	212491	380403	594380		1093659			
2900	3002	65873	148215	214089	383264	598850		1101883			
2915	3017	66370	149332	215702	386152	603362		1110187			
2929	3032	66871	150460	217331	389068	607919		1118571			
2944	3047	67377	151599	218976	392013	612521		1127039			
2958	3061	67889	152749	220638	394988	617169		1135592			
2973	3076	68405	153912	222317	397994	621866		1144233			
2987	3091	68927	155086	224014	401031	626611		1152965			
3002	3106	69455	156273	225728	404101	631408		1161790			
3016	3121	69988	157473	227462	407204	636256		1170711			
3031	3136	70527	158687	229214	410341	641158		1179732			
3045	3151	71073	159914	230987	413514	646116		1188854			

To obtain capacity at 10% overpressure multiply by [(1.1 x SP+14.7)/(1.03 x SP + 14.7)]

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / SUPERHEAT CORRECTION FACTOR

SUPERHEAT CORRECTION FACTOR K_{SH}

K_{SH}		Temperature									
Set pressure psig	bar	300 °F	400 °F	500 °F	600 °F	700 °F	800 °F	900 °F	1000 °F	1100 °F	1200 °F
		149 °C	204 °C	260 °C	316 °C	371 °C	427 °C	482 °C	538 °C	593 °C	649 °C
15	1	1.00	0.98	0.93	0.88	0.84	0.80	0.77	0.74	0.72	0.70
20	1.4	1.00	0.98	0.93	0.88	0.84	0.80	0.77	0.74	0.72	0.70
40	2.8	1.00	0.99	0.93	0.88	0.84	0.81	0.77	0.74	0.72	0.70
60	4.1	1.00	0.99	0.93	0.88	0.84	0.81	0.77	0.75	0.72	0.70
80	6	1.00	0.99	0.93	0.88	0.84	0.81	0.77	0.75	0.72	0.70
100	7	1.00	0.99	0.94	0.89	0.84	0.81	0.77	0.75	0.72	0.70
120	8	1.00	0.99	0.94	0.89	0.84	0.81	0.78	0.75	0.72	0.70
140	10	1.00	0.99	0.94	0.89	0.85	0.81	0.78	0.75	0.72	0.70
160	11	1.00	0.99	0.94	0.89	0.85	0.81	0.78	0.75	0.72	0.70
180	12	1.00	0.99	0.94	0.89	0.85	0.81	0.78	0.75	0.72	0.70
200	14	1.00	0.99	0.95	0.89	0.85	0.81	0.78	0.75	0.72	0.70
220	15	1.00	0.99	0.95	0.89	0.85	0.81	0.78	0.75	0.72	0.70
240	17	1.00	1.00	0.95	0.90	0.85	0.81	0.78	0.75	0.72	0.70
260	18	1.00	1.00	0.95	0.90	0.85	0.81	0.78	0.75	0.72	0.70
280	19	1.00	1.00	0.96	0.90	0.85	0.81	0.78	0.75	0.72	0.70
300	21	1.00	1.00	0.96	0.90	0.85	0.81	0.78	0.75	0.72	0.70
350	24	1.00	1.00	0.96	0.90	0.86	0.82	0.78	0.75	0.72	0.70
400	28	1.00	1.00	0.96	0.91	0.86	0.82	0.78	0.75	0.72	0.70
500	34	1.00	1.00	0.96	0.92	0.86	0.82	0.78	0.75	0.73	0.70
600	41	1.00	1.00	0.97	0.92	0.87	0.82	0.79	0.75	0.73	0.70
800	55	1.00	1.00	1.00	0.95	0.88	0.83	0.79	0.76	0.73	0.70
1000	69	1.00	1.00	1.00	0.96	0.89	0.84	0.78	0.76	0.73	0.71
1250	86	1.00	1.00	1.00	0.97	0.91	0.85	0.80	0.77	0.74	0.71
1500	103	1.00	1.00	1.00	1.00	0.93	0.86	0.81	0.77	0.74	0.71
1750	121	1.00	1.00	1.00	1.00	0.94	0.86	0.81	0.77	0.73	0.70
2000	138	1.00	1.00	1.00	1.00	0.95	0.86	0.80	0.76	0.72	0.69
2500	172	1.00	1.00	1.00	1.00	0.95	0.85	0.78	0.73	0.69	0.66
3000	207	1.00	1.00	1.00	1.00	1.00	0.82	0.74	0.69	0.65	0.62

SAPAG STEAM SAFETY VALVE
 SERIES 9100 / REACTION FORCE AND NOISE LEVEL

REACTION FORCE in daN, CALCULATION FOR SATURATED STEAM (AT 10% OVERPRESSURE)

Set pressure (bar)	Relieving bar abs	Temperature °C	Orifice No										
			0	1	1	2	3	4	5	8	6	7	9
			Orifice 'A' (cm²)										
			2.85	6.4	6.4	9.25	16.5	25.8	45.8	47.48	71.2	103.25	129.3
			Outlet NPS										
			3	3	4	4	6	6	6	8	8	10	10
Outlet DN													
80	80	100	100	150	150	150	200	200	250	250			
Outlet section (cm²)													
45.60	45.60	81.07	81.07	182.41	182.41	182.41	324.29	324.29	506.71	506.71			
daN													
40	45	260	276	392	534	627	1270	1574	2229	2852	3628	5407	6260
45	51	268	311	442	602	707	1431	1775	2515	3216	4094	6100	7064
50	56	275	346	492	670	787	1593	1977	2803	3582	4561	6797	7873
55	62	281	381	543	738	868	1756	2180	3092	3949	5031	7497	8685
60	67	287	416	593	806	949	1919	2384	3383	4318	5503	8199	9501
65	73	293	451	644	875	1030	2082	2588	3675	4688	5977	8904	10320
70	78	298	487	695	943	1111	2246	2792	3967	5059	6452	9612	11142
75	84	304	522	746	1012	1192	2410	2998	4261	5431	6930	10322	11967
80	89	308	558	798	1081	1274	2575	3204	4556	5804	7408		
85	95	313	593	849	1150	1356	2740	3410	4851	6179	7888		
90	100	318	629	900	1220	1438	2905	3617	5148	6554	8369		
100	111	326	700	1004	1358	1602	3236	4032	5744	7306	9336		
110	122	334	771	1108	1498	1767	3569	4449	6342	8062	10308		
120	133	341	843	1212	1637	1933	3902	4868	6944	8821	11283		
130	144	348	915	1316	1777	2099	4236	5288	7548	9582	12264		
140	155	354	987	1421	1918	2266	4572	5709	8155	10347	13247		
150	166	360	1059	1526	2058	2433	4908	6132	8764	11113	14235		
160	177	366	1131	1632	2199	2601	5245	6556	9375	11882	15226		
170	188	372	1204	1738	2341	2769	5582	6981	9989	12653	16220		
180	199	377	1276	1844	2482	2938	5921	7407	10604	13426	17218		
190	210	382	1349	1950	2624	3107	6260	7835		14202			
200	221	387	1422	2057	2766	3276	6600	8263		14979			
210	232	392	1495	2164	2909	3446	6940	8693		15758			

NOISE LEVEL AT 30 m (AT 10% OVERPRESSURE)

Set pressure bar	Relieving bar abs	Orifice 'A'											
		0	1	2	3	4	5	8	6	7	9		
		Area (cm²)											
		2.85	6.4	9.25	16.5	25.8	45.8	47.48	71.2	103.25	129.3		
dB(A)													
40	45	112	117	119	123	125	129	129	131	134	135		
45	51	113	118	120	123	126	130	130	132	135	136		
50	56	114	119	121	124	127	130	131	133	135	137		
55	62	114	119	121	125	128	131	131	134	136	138		
60	67	115	120	122	126	128	132	132	135	137	138		
65	73	116	121	123	126	129	133	133	135	137	139		
70	78	116	121	123	127	130	133	133	136	138	139		
75	84	117	122	124	127	130	134	134	136	139	140		
80	89	117	122	124	128	131	134	134	137				
85	95	118	123	125	128	131	135	135	137				
90	100	118	123	125	129	132	135	135	138				
100	111	119	124	126	130	132	136	136	139				
110	122	120	125	127	130	133	137	137	139				
120	133	120	125	128	131	134	137	137	140				
130	144	121	126	128	132	134	138	138	141				
140	155	122	126	129	132	135	138	139	141				
150	166	122	127	129	133	135	139	139	142				
160	177	123	128	130	133	136	139	140	142				
170	188	123	128	130	134	136	140	140	143				
180	199	124	128	131	134	137	140	141	143				
190	210	124	129	131	135	137		141					
200	221	124	129	131	135	138		141					
210	232	125	130	132	135	138		142					