



# Air Vents & Liquid Drainers

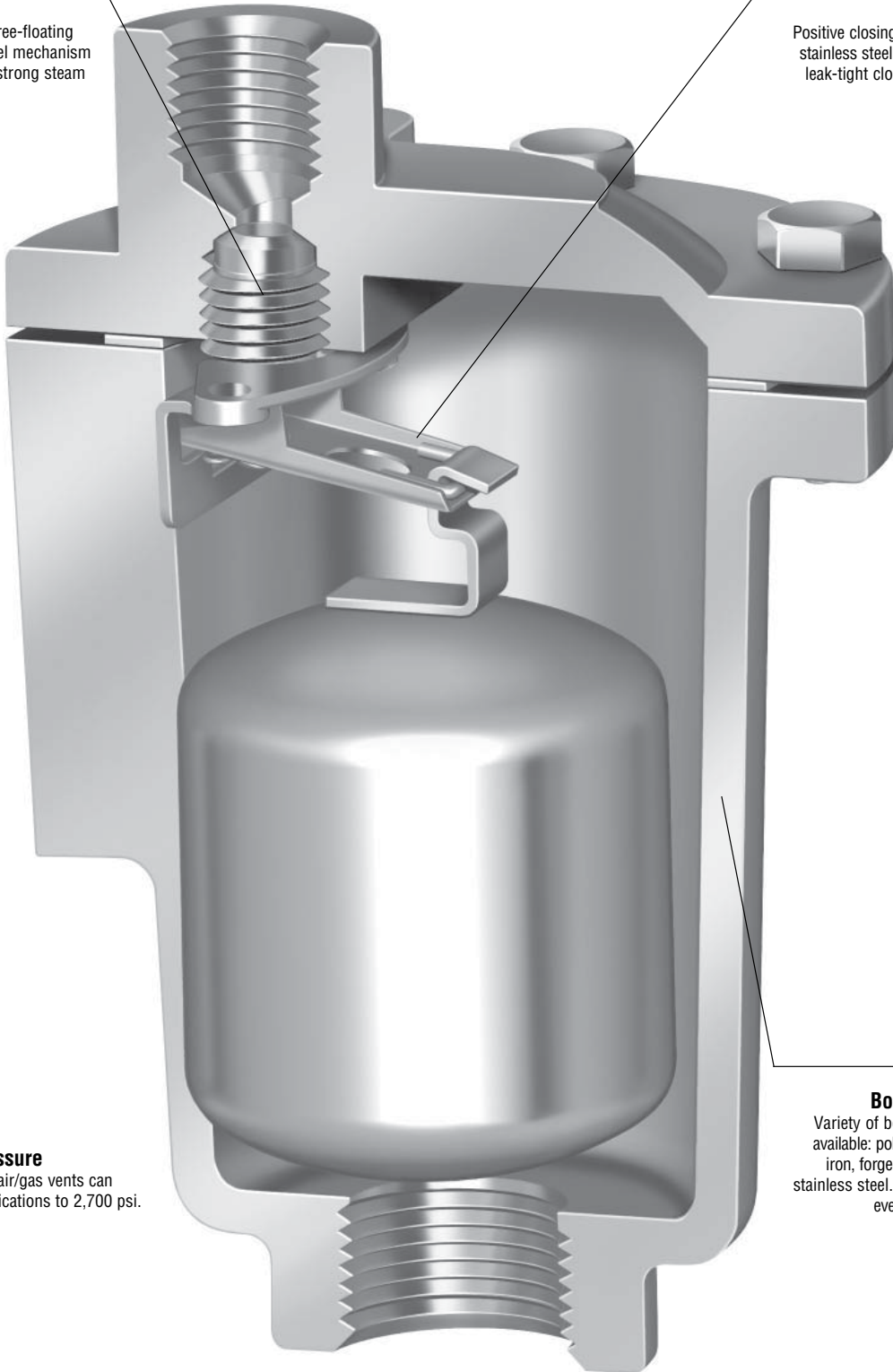
## Air Vents

**Proven**

Same proven, free-floating all stainless steel mechanism as used in Armstrong steam traps.

**Leak-tight**

Positive closing, free-floating stainless steel lever ensures leak-tight closing under all conditions.



**High pressure**

Armstrong air/gas vents can handle applications to 2,700 psi.

**Body options**

Variety of body materials available: polysulfone, cast iron, forged steel and all stainless steel. A material for every application.

## Selecting The Armstrong Air/Gas Vent

With the desired CFM capacity known, find the orifice size required from the table on this page. Then find the vent or vents with the correct orifice size on pages 447, 449, 451 or 459 that will operate at the required pressure with a liquid of the specific gravity being handled.

Example—Find a model number that will vent 52 cfm of air (including safety factor of 1.5 - 2.0) from a liquid with a specific gravity of 0.93 at 250 psi. Using the table below, follow the 250 psi line across to the number 60.9. Orifice size is 5/32". Now go to pages 447, 449, 451 or 459 checking the 5/32" orifice lines to locate a vent for 250 psi or higher with 0.90 gravity liquid.

**NOTE:** Since specific gravity falls between 0.95 and 0.90, use 0.90 gravity data. The model 3-AV on page 446 is the one to use.

$$V = \frac{W}{d} = \frac{2.05 C A P_2 \times 60}{d} \sqrt{\frac{\left(\frac{P_1}{P_2}\right)^{283} \left[\left(\frac{P_1}{P_2}\right)^{283} - 1\right]}{T}}$$

Where:

- V = Volume flow rate, ft<sup>3</sup>/min
- W = Mass flow rate, lb/min
- d = Density, 0.07494 lb/ft<sup>3</sup> at standard conditions
- C = Flow coefficient = 0.65
- A = Orifice area, in<sup>2</sup>
- P1 = Upstream pressure, psia
- P2 = Pressure at throat orifice or downstream pressure = greater of 0.53 P1 or 14.7 psia
- T = Upstream temperature = 530°R

Ref: Baumeister & Marks, Standard Handbook for Mechanical Engineers, 7th edition.

### For Venting During Filling Only

If a vent is required only for getting rid of air when a system is started up, such as when starting up a deep well pump or filling an empty pipe, tank or other vessel, ability of the vent to open at operating pressure can be ignored. In these cases, a model number with a large orifice for fast venting may be selected, **but the vent will not open after air is expelled and the system reaches operating pressure.**

Discharge of Air Through an Orifice in Standard Cubic Feet per Minute at a Standard Atmospheric Pressure of 14.7 psia and 70°F																						
pressure psig	Orifice Diameter, inches																					
	1/16	5/64	3/32	#38	7/64	1/8	9/64	5/32	3/16	7/32	1/4	9/32	5/16	11/32	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1-1/8
5	0.64	1.00	1.44	1.54	1.96	2.56	3.24	4.00	5.76	7.84	10.2	13.0	16.0	19.4	23.0	31.4	41.0	51.9	64.0	92.2	125	185
6	0.70	1.09	1.57	1.69	2.14	2.80	3.54	4.37	6.30	8.57	11.2	14.2	17.5	21.2	25.2	34.3	44.8	56.7	70.0	101	137	202
7	0.75	1.18	1.70	1.82	2.31	3.02	3.82	4.71	6.78	9.23	12.1	15.3	18.8	22.8	27.1	36.9	48.2	61.1	75.4	109	148	218
9	0.85	1.33	1.91	2.05	2.61	3.40	4.31	5.32	7.66	10.4	13.6	17.2	21.3	25.7	30.6	41.7	54.4	68.9	85.1	122	167	246
12	0.98	1.52	2.19	2.35	2.99	3.90	4.94	6.10	8.78	11.9	15.6	19.8	24.4	29.5	35.1	47.8	62.4	79.0	97.5	140	191	282
15	1.09	1.70	2.44	2.62	3.33	4.34	5.50	6.79	9.78	13.3	17.4	22.0	27.2	32.9	39.1	53.2	69.5	88.0	109	156	213	314
20	1.27	1.98	2.86	3.06	3.89	5.08	6.42	7.93	11.4	15.5	20.3	25.7	31.7	38.4	45.7	62.2	81.2	103	127	183	249	367
25	1.45	2.27	3.27	3.50	4.45	5.81	7.35	9.07	13.1	17.8	23.2	29.4	36.3	43.9	52.3	71.1	92.9	118	145	209	285	420
30	1.63	2.55	3.68	3.94	5.01	6.54	8.28	10.2	14.7	20.0	26.2	33.1	40.9	49.5	58.9	80.1	105	132	163	235	320	472
35	1.82	2.84	4.09	4.38	5.57	7.27	9.20	11.4	16.4	22.3	29.1	36.8	45.4	55.0	65.4	89.1	116	147	182	262	356	525
40	2.00	3.13	4.50	4.82	6.13	8.00	10.1	12.5	18.0	24.5	32.0	40.5	50.0	60.5	72.0	98.0	128	162	200	288	392	578
45	2.18	3.41	4.91	5.26	6.69	8.73	11.1	13.6	19.6	26.7	34.9	44.2	54.6	66.0	78.6	107	140	177	218	314	428	631
50	2.37	3.70	5.32	5.70	7.25	9.46	12.0	14.8	21.3	29.0	37.9	47.9	59.2	71.6	85.2	116	151	192	237	341	464	684
60	2.73	4.27	6.15	6.58	8.37	10.9	13.8	17.1	24.6	33.5	43.7	55.3	68.3	82.6	98.3	134	175	221	273	393	535	790
70	3.10	4.84	6.97	7.46	9.49	12.4	15.7	19.4	27.9	37.9	49.6	62.7	77.4	93.7	112	152	198	251	310	446	607	895
80	3.46	5.41	7.79	8.34	10.6	13.9	17.5	21.6	31.2	42.4	55.4	70.1	86.6	105	125	170	222	281	346	499	679	1,001
90	3.83	5.98	8.62	9.2	11.7	15.3	19.4	23.9	34.5	46.9	61.3	77.5	95.7	116	138	188	245	310	383	551	750	1,107
100	4.19	6.55	9.44	10.1	12.8	16.8	21.2	26.2	37.8	51.4	67.1	84.9	105	127	151	206	268	340	419	604	822	1,212
110	4.56	7.13	10.3	11.0	14.0	18.2	23.1	28.5	41.0	55.9	73.0	92.4	114	138	164	223	292	369	456	657	894	1,318
125	5.11	7.98	11.5	12.3	15.6	20.4	25.9	31.9	46.0	62.6	81.7	103	128	155	184	250	327	414	511	736	1,001	1,477
150	6.02	9.41	13.6	14.5	18.4	24.1	30.5	37.6	54.2	73.8	96.4	122	151	182	217	295	385	488	602	867	1,181	1,741
200	7.85	12.3	17.7	18.9	24.0	31.4	39.8	49.1	70.7	96.2	126	159	196	238	283	385	503	636	785	1,131	1,539	2,269
250	9.68	15.1	21.8	23.3	29.6	38.7	49.0	60.5	87.1	119	155	196	242	293	348	474	620	784	968	1,394	1,897	2,798
300	11.5	18.0	25.9	27.7	35.2	46.0	58.3	71.9	104	141	184	233	288	348	414	564	737	932	1,151	1,657	2,256	3,326
400	15.2	23.7	34.1	36.5	46.4	60.7	76.8	94.8	136	186	243	307	379	459	546	743	971	1,228	1,517	2,184	2,973	4,383
500	18.8	29.4	42.4	45.3	57.6	75.3	95.3	118	169	231	301	381	471	569	678	922	1,205	1,525	1,882	2,711	3,689	5,440
600	22.5	35.1	50.6	54.1	68.8	89.9	114	141	202	275	360	455	562	680	809	1,102	1,439	1,821	2,248	3,237	4,406	6,497
750	28.0	43.7	62.9	67.4	85.6	112	142	175	252	343	447	566	699	846	1,007	1,370	1,790	2,265	2,797	4,027	5,481	8,082
1000	37.1	58.0	83.5	89.4	114	148	188	232	334	455	594	751	928	1,123	1,336	1,818	2,375	3,006	3,711	5,344	7,273	10,725

### Air Vent ID Charts

Illustration	Type	Flow Direction	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Model	Max. Oper. Press. psig	Connection Size							Located on Page	
									1/8"	1/4"	1/2"	3/4"	1"	1-1/2"	2"		
	<b>Series 1-AVCW</b> See-Thru Free Floating Lever Air Vents for Ozone Applications		Screwed	150	150	PBT Cap (Polybutylene Terephthalate) Polysulfone Body	<b>1-AVCW</b>	150			▲	★★					445
	<b>Series 1-AVC</b> See-Thru Free Floating Lever Air/Gas Vents		Screwed	150	150	Nylon Cap Polysulfone Body	<b>1-AVC</b>	150				★★					444
	<b>Series 21-AR</b> Fixed Pivot Ball Float Air/Gas Vents		Screwed	250	450	ASTM A48 Class 30 Cast Iron	<b>21-AR</b>	250			●	●					459
	<b>Series 21-312</b> Fixed Pivot Ball Float Air/Gas Vents		Screwed Socketweld Flanged †††	600 or 500	100 or 750	ASTM A105 Forged Steel	<b>21-312AR</b>	68			●	●					459
								<b>21-312VAR</b>	600			●	●				
	<b>Series 1, 2, 3, 6</b> Free Floating Lever Air/Gas Vents		Screwed	300	200	ASTM A48 Class 30 Cast Iron	<b>1-AV†</b>	300			★	★					446
				250	450		<b>2-AV</b>	250			●	●					
							<b>3-AV</b>	250			●	●					
							<b>3-AV</b>	250					●	●			
	<b>Series 30</b> Free Floating Lever Air/Gas Vents		Screwed Socketweld Flanged †††	600 or 500	100 or 750	ASTM A105 Forged Steel	<b>32-AV</b>	600			●	●					448
				1,000 or 600	100 or 750		<b>33-AV</b>	900			●	●	●				
				1,000 or 600	100 or 750		<b>36-AV</b>	1000					●	●			
	<b>Series 10</b> Free Floating Lever Air/Gas Vents		Screwed Socketweld (22 and 13 only)	500 or 440	100 or 500	304-L Stainless Steel	<b>11-AV ††</b>	400			●	★★					450
				555 or 475	100 or 500		<b>22-AV</b>	555			●						
				570 or 490	100 or 500		<b>13-AV</b>	570					●				
	<b>Series HLAR</b> High Leverage Air/Gas Vents		Screwed Socketweld Flanged †††	100 or 600	100 or 750	ASTM A105 Forged Steel	<b>2313 HLAR</b>	1,000			●	●	●				452
							<b>2315 HLAR</b>					●	●	●			
							<b>2316 HLAR</b>						●	●			
	<b>Series HLAR</b> High Leverage Air/Gas Vents		Screwed Socketweld Flanged †††	1,500 or 900	100 or 850	ASTM A182 Gr. F22 Forged Steel	<b>2413 HLAR</b>	1,500			●	●	●				452
				1,800 or 900	100 or 900		<b>2415 HLAR</b>	1,800				●	●	●			
							<b>2416 HLAR</b>	1,500						●	●	●	

★ 1/4" outlet connection    ★★ 1/2" outlet connection    † Side connection available    ▲ Alternate inlet 1/2"  
 †† Side connection not available    ††† Flange selection may limit pressure and temperature rating.

### Air Vent ID Charts

Illustration	Type	Flow Direction	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Model	Max. Oper. Press. psig	Connection Size							Located on Page
									1/8"	1/4"	1/2"	3/4"	1"	1-1/2"	2"	
	Series HLAR High Leverage Air/Gas Vents		Screwed Socketweld Flanged †††	2,120 or 1,700	100 or 900	ASTM A182 Gr. F22 Forged Steel	25133G- HLAR	2,125			●	●	●			452
				2,520 or 2,000	100 or 900		25155G- HLAR	2,500				●	●	1-1/4	●	
				3,700 or 3,000	100 or 900		26155G- HLAR	2,700					●	1-1/4	●	
	Series TTF Thermostatic Air Vents		Straight-Thru Right Angle	300	450	304-L Stainless Steel	TTF-1  TTF-1R	300			●	●				454
	Series TV-2 Thermostatic Air Vents		Screwed	125	350	ASTM B62 Cast Bronze	TV-2	125			●					455
	Series TS-2 Thermostatic Air Vents		Threaded	50	300	ASTM B62 Bronze	TS-2	50			●	●				456
	AV-11, AV-13 Air Vents		Screwed	50 150	210	Brass	AV-11 AV-13	50 150	●		●	●				457
	SV-12 Steam Radiator Air Vent		Threaded	15	250	Nickel Plated Brass	SV-12	15	●	●	●	●				458

★ 1/4" outlet connection    ★★ 1/2" outlet connection    † Side connection available    ▲ Alternate inlet 1/2"  
 †† Side connection not available    ††† Flange selection may limit pressure and temperature rating.

## 1-AVC See-Thru Air Vent

For Pressures to 150 psig (7 bar) or Specific Gravity Down to 0.80

### A See-Thru Body—So You'll Know When It's Working

Now, you can literally see what you've been missing—the early warning signs of a system problem. Since you'll know the operating condition of the air vent, you won't have to waste time and money scheduling maintenance that isn't needed. In other words, you will be able to react to a condition before it becomes a problem.

A simple ball float mechanism requiring no electricity to operate, the new Armstrong 1-AVC discharges automatically only when air/gas are present. That means no liquid loss as with manual venting.

### An Inside Look

See-thru body means you can observe changing conditions as they occur. See a problem in the making—instead of having to deal with it after the fact.

### Efficient Operation

Simple ball float mechanism discharges only when air is present so it doesn't waste liquid.

### Positive Seating

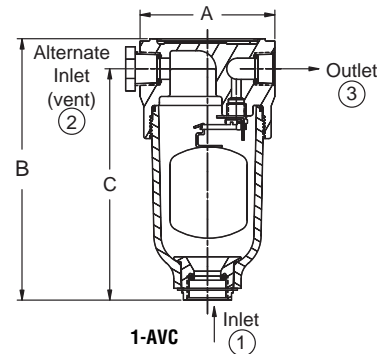
Free-floating valve mechanism assures positive seating so it prevents liquid loss. There are no fixed pivots to wear or create friction, and wear points are heavily reinforced for long life.

### Reduced Maintenance

Stainless steel internals mean corrosion resistance and reduced maintenance.

### Corrosion Resistance

Long-lasting polysulfone body and reinforced nylon cap resist corrosion and provide long, trouble-free service life.



### How to Order

Inlet ①	Alternate Inlet ②	Outlet ③
3/4"	1/2"	1/2"
1/2" or 3/4"	1/2" or 3/4"	1/2"

**NOTE:** The Armstrong 1-AVC should not be used in an environment where there are high levels of ketones or chlorinated or aromatic hydrocarbons.

For a fully detailed certified drawing, refer to CD #1031.

List of Materials	
Name of Part	Material
Cap	Reinforced Nylon*
Body	Polysulfone
O-Rings (Body Cap and Fitting)	Nitrile Elastomer Compound
Float Lever and Screws	Stainless Steel
Valve & Seat	Stainless Steel
Fitting & Pipe Plug	Reinforced Nylon
Retainer Ring	Zinc Plated Steel

\*UV sensitive.

Physical Data		
	in	mm
Inlet Connection	1/2, 3/4	15, 20
Outlet Connection	1/2	15
"A" Face-to-Face	3-1/2	89
"B" Height	6-3/4	171
"C" Bottom to $\phi$	6 1	52
Maximum Allowable Pressure (Vessel Design)	150 psig @ 150°F (10 bar @ 65°C)	
Maximum Operating Pressure	150 psi (10 bar)	
Specific Gravity Range	1.00 to 0.80	
Weight, lb (kg)	1 (.45)	

Model 1-AVC Capacity				
Differential Pressure		Orifice Size	scfm	m <sup>3</sup> /hr
psig	bar			
15	1.0	1/8"	4.3	7.3
30	2.0		6.5	11.0
50	3.5		9.5	16.1
75	5.0		13.1	22.2
100	7.0		16.9	28.7
125	8.5		20.5	34.8
150	10.5		24.2	41.3

NOTE: Discharge of air through an orifice in scfm (standard cubic feet of free air per minute) at a standard atmospheric pressure of 14.7 psi (1 bar) and 70°F (21°C).

## 1-AVCW See-Thru Air Vent for Ozone Applications

For Pressures to 150 psig (10 bar) or Specific Gravity Down to 0.80

### What Is Ozone?

Ozone is a gas that forms naturally during thunderstorms when lightning converts normal oxygen molecules (O<sub>2</sub>) into ozone (O<sub>3</sub>). The fresh, sweet smell in the air after a storm is the smell of ozone. The unstable ozone molecule reacts rapidly with most substances and is an extremely strong natural oxidant.

### How Is Commercial Ozone Produced?

Ozone can be formed by exposing air to ultraviolet light; however, the most common method of generating ozone is by passing air through an electrical discharge. Because ozone has strong oxidizing properties, its production requires corrosion-resistant equipment.

### How Is Ozone Used in Water Filtration and Purification?

Because ozone is such an effective oxidant, it kills viruses, bacteria, mold, mildew, fungus and germs. Passing ozone through water achieves high purification rates without any chemical residue. Oxygen is the only by-product.

### Typical Customer Applications:

- Purifying standing ground water in Third World countries.
- Conditioning water for poultry and livestock.
- Purifying water in the bottled water industry.
- Filtering and purifying water for process applications.

### A See-Thru Body Shows You It's Working

Now, you can literally see what you've been missing. The Armstrong 1-AVCW See-Thru Air Vent lets you easily check its operating condition. You won't have to waste time and money scheduling maintenance that isn't needed, and you can quickly react to a condition before it becomes a problem.

### Efficient Operation

Simple ball-float mechanism doesn't need electricity to operate. The air vent automatically discharges only when air or gas is present. No liquid is lost, as with manual venting.

### Positive Seating

Free-floating valve mechanism ensures positive seating and prevents liquid loss. There are no fixed pivots to wear or create friction. Wear points are heavily reinforced for long life.

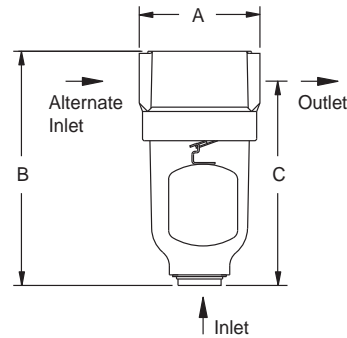
### Corrosion Resistance

Long-lasting PBT (polybutylene terephthalate) cap provides trouble-free operation. Stainless steel internal parts resist corrosion and reduce maintenance.

### Compare—and Save the Difference

Seeing really is believing—especially when you compare the Armstrong 1-AVCW See-Thru Air Vent with manual venting. Measure the time and money you can save with a more efficient, easier-to-maintain system. For more information or technical assistance, contact your local Armstrong Representative.

**NOTE: The Armstrong 1-AVCW should not be used in an environment where there are high levels of ketones or chlorinated or aromatic hydrocarbons.**



1-AVCW

List of Materials	
Name of Part	Material
Cap	PBT (Polybutylene Terephthalate)
Body	Polysulfone*
O-Rings (Body Cap and Fitting)	Viton®
Float Lever and Screws	Stainless Steel
Valve & Seat	Stainless Steel
Fitting	PBT (Polybutylene Terephthalate)
Retainer Ring	Zinc Plated Steel

\*UV sensitive

Physical Data		
	in	mm
Inlet Connection (In Body)	3/4	20
Inlet Connection (Alternate)	1/2	15
Outlet Connection	1/2	15
"A" Face-to-Face	3-1/2	89
"B" Height	6-13/16	172
"C" Bottom to C	6	152
Maximum Allowable Pressure (Vessel Design)	150 psig @ 150°F (10 bar @ 66°F)	
Maximum Operating Pressure	150 psi (10 bar)	
Specific Gravity Range	1.00 to 0.80	
Weight, lb (kg)	1 (.5)	

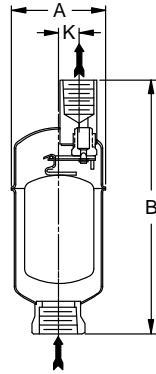
Model 1-AVCW Capacity				
Differential Pressure		Orifice Size	scfm	m³/hr
psig	bar			
15	1.0	1/8"	4.3	7.3
30	2.0		6.5	11.0
50	3.5		9.5	16.1
75	5.0		13.1	22.2
100	7.0		16.9	28.7
125	8.5		20.5	34.8
150	10.5		24.2	41.3

**NOTE:** Discharge of air through an orifice in scfm (standard cubic feet of free air per minute) at a standard atmospheric pressure of 14.7 psi (1 bar) and 70°F (21°C).

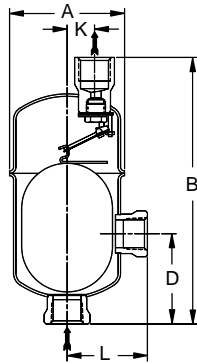
For a fully detailed certified drawing, refer to CD #1264.

### Free Floating Lever Air/Gas Vents—All Stainless Steel

For Pressures to 600 psig (41 bar) or Specific Gravity Down to 0.50



Model 11-AV



Model 22-AV and 13-AV



The Armstrong all-stainless steel guided lever air vents have been developed to provide positive venting of air/gases under pressure.

The body and cap and all working parts of the No. 11-AV, 22-AV and 13-AV are made of high strength, corrosion resistant stainless steel. Body and caps are welded together to form a permanently sealed, tamperproof unit with no gaskets. Elliptical floats and high leverage provide up to 115 SCFM capacity for these compact air/gas vents. Lever action is guided to assure proper seating of the valve under all operating conditions.

**11-AV, 22-AV and 13-AV**—All stainless steel construction where exposure to either internal or external corrosion is a problem. These air/gas vents have the same proven free floating mechanisms used in other Armstrong steam traps. Pressures to 600 psi @ 100°F (41 bar @ 38°C).

For a fully detailed certified drawing, refer to list below:  
**11-AV CD #1066**  
**13-AV and 22-AV CD #1086**

#### Physical Data

Model No.	11-AV		22-AV		13-AV	
Pipe Connections	1/2, 3/4**	15, 20**	3/4	20	1	25
"A"	2-3/4	70	3-7/8	99	4-1/2	114
"B"	7-1/4	184	8-13/16	224	11-3/8	289
"D"	—	—	3-3/8	86	6-1/8	156
"K"	9/16	14	7/8	22	1-3/16	30
"L"	—	—	2-5/8	67	3-1/4	83
Weight, lb (kg)			5 (2.3)		7-1/2 (3.4)	
Max. Allow. Pressure (Vessel Design)	500 psig @ 100°F (34 bar @ 38°C) 440 psig @ 500°F (30 bar @ 260°C)		600 psig @ 100°F (41 bar @ 38°C) 475 psig @ 500°F (33 bar @ 260°C)		570 psig @ 100°F (39 bar @ 38°C) 490 psig @ 500°F (34 bar @ 260°C)	

\*\* 1/2" (15 mm) outlet.

#### List of Materials

Model No.	Valve & Seat	Leverage System	Float	Body & Cap
11-AV	*440 Stainless Steel	303/304 Stainless Steel	304 Stainless Steel	Sealed Stainless Steel 304-L
22-AV				
13-AV				

\*Type 316 SS valve and seat available. Consult factory.



## Free Floating Lever Air/Gas Vents—All Stainless Steel

For Pressures to 600 psig (41 bar) or Specific Gravity Down to 0.50

Maximum Operating Pressures of free floating lever vents with weighted floats for different orifice sizes, and the specific gravities on which they can be used.

11-AV Maximum Operating Pressures				
Minimum Specific Gravity	0.75		0.50	
Float wt., oz (g)	2.90 (82) Standard		2.08 (59) Special	
Orifice Size (in)	Maximum Operating Pressure			
	psi		bar	
1/8	178	12	118	8
#38	267	18	177	12
5/64	400	28	311	21

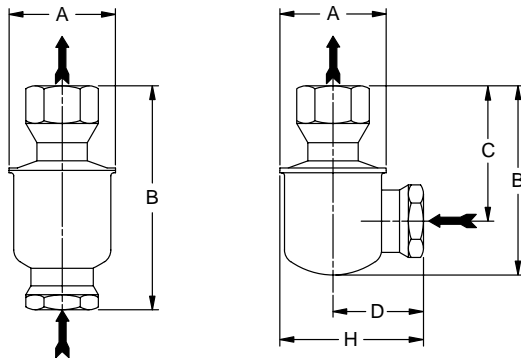
22-AV Maximum Operating Pressure																							
Specific Gravity*	1.00		0.95		0.90		0.85		0.80		0.75		0.70		0.65		0.60		0.55		0.50		
Float wt., oz (g)	10.0 (282)		9.5 (268)		9.0 (254)		8.5 (240)		8.0 (226)		7.5 (212)		5.4 (152)		5.0 (141)		4.6 (130)		4.2 (119)		3.8 (109)		
Orifice Size (in)	Maximum Operating Pressure																						
	psi		bar		psi		bar		psi		bar		psi		bar		psi		bar		psi		bar
5/16	35	2.4	33	2.3	31	2.2	30	2.0	28	1.9	26	1.8	19	1.3	18	1.2	16	1.1	15	1.0	14	0.9	
1/4	57	3.9	54	3.7	51	3.5	49	3.4	46	3.2	43	3.0	31	2.1	29	2.0	27	1.8	24	1.7	22	1.5	
3/16	126	8.7	120	8.2	113	7.8	107	7.4	101	7.0	95	6.5	68	4.7	64	4.4	59	4.1	54	3.7	49	3.4	
5/32	217	14.9	206	14.2	195	13.5	185	12.7	174	12.0	163	11.2	118	8.1	110	7.6	101	7.0	93	6.4	85	5.8	
1/8	371	25.6	352	24.3	334	23.0	316	21.8	297	20.5	279	19.2	202	13.9	187	12.9	173	12.0	159	11.0	145	10.0	
7/64	474	32.7	451	31.1	427	29.5	404	27.9	380	26.2	357	24.6	258	17.8	240	16.5	222	15.3	204	14.0	186	12.8	
#38	590	40.7	561	38.7	532	36.7	503	34.7	473	32.7	444	30.6	321	22.1	298	20.6	276	19.0	253	17.5	231	15.9	
5/64	600	41.4	600	41.4	600	41.4	600	41.4	600	41.4	600	41.4	473	32.6	440	30.3	407	28.1	374	25.8	341	23.5	

13-AV Maximum Operating Pressures																			
Specific Gravity*	1.00		0.95		0.90		0.85		0.80		0.75		0.70		0.65		0.60		
Float wt., oz (g)	14.9 (423)		14.2 (402)		13.4 (381)		12.7 (360)		12.0 (339)		11.2 (318)		10.5 (296)		9.7 (275)		9.0 (254)		
Orifice Size (in)	Maximum Operating Pressure																		
	psi		bar		psi		bar		psi		bar		psi		bar		psi		bar
1/2	21	1.5	20	1.4	19	1.3	18	1.3	17	1.2	16	1.1	15	1.0	14	1.0	13	0.9	
3/8	45	3.1	43	3.0	41	2.8	38	2.7	36	2.5	34	2.3	32	2.2	30	2.0	27	1.9	
5/16	72	5.0	69	4.7	65	4.5	61	4.2	58	4.0	54	3.8	51	3.5	47	3.3	44	3.0	
9/32	96	6.6	91	6.3	87	6.0	82	5.6	77	5.3	72	5.0	68	4.7	63	4.3	58	4.0	
1/4	144	9.9	137	9.4	130	8.9	123	8.5	116	8.0	109	7.5	102	7.0	94	6.5	87	6.0	
7/32	206	14	196	13	186	13	176	12	165	11	155	10.7	145	10.0	135	9.3	125	8.6	
3/16	309	21	294	20	279	19	264	18	249	17	234	16	218	15	203	14	188	13	
5/32	484	33	460	32	437	30	413	28	389	27	365	25	342	24	318	22	294	20	
1/8	570	39	570	39	570	39	570	39	570	39	570	39	570	39	570	39	570	39	
7/64	570	39	570	39	570	39	570	39	570	39	570	39	570	39	570	39	570	39	

\*If specific gravity falls between those shown, use next lowest: e.g., if actual gravity is 0.73, use 0.70 specific gravity data.

## Armstrong Stainless Steel Thermostatic Air Vents

For Pressures to 300 psig (20 bar)...Capacities to 104 scfm



**TTF-1**  
Straight-Thru

**TTF-1R**  
Right Angle



Armstrong offers Thermostatic Air Vents for positive venting of air and other non-condensable gases from steam in chamber type heat transfer equipment. Typical applications include jacketed kettles, retorts, vulcanizers, jacketed sterilizers or other contained equipment where air could accumulate in remote areas of the steam chamber and reduce heat transfer capacity. These vents are balanced pressure air vents that respond to the pressure-temperature curve of steam. Air is automatically vented at slightly below steam temperature throughout the entire operating pressure range.

### Features

- Suitable for pressures from 0 - 300 psig
- All 304-L stainless steel bodies—sealed, tamper-proof
- Balanced pressure thermostatic element vents air at slightly below steam temperature over the entire pressure range—no adjustments required
- Dependable, proven phosphor-bronze bellows caged in stainless steel with bronze valve and stainless steel seat
- Available in straight-thru or right-angle connections

Armstrong thermostatic air vents should be installed at the highest point on a steam chamber, with the air vent located above the chamber. This will minimize the possibility of any liquid carryover, and air can be vented at atmosphere without a drain line.

List of Materials	
Name of Part	Material
Body	304-L Stainless steel
Connections	304 Stainless steel
Balanced Pressure Thermostatic Air Vent	Stainless steel and bronze with phosphor-bronze bellows, entire unit caged in stainless steel
Gasket	Copper clad non-asbestos

Optional: All stainless steel thermostatic air vent.

Physical Data								
Model No.	Straight-Thru Connections TTF-1				Right-Angle Connections TTF-1R			
	in	mm	in	mm	in	mm	in	mm
<b>Pipe Connections</b>	<b>1/2</b>	<b>15</b>	<b>3/4</b>	<b>20</b>	<b>1/2</b>	<b>15</b>	<b>3/4</b>	<b>20</b>
"A" Diameter	2-1/4	57	2-1/4	57	2-1/4	57	2-1/4	57
"B" Height	4-1/2	114	4-11/16	119	3-3/4	95	3-15/16	100
"C" $\varnothing$ inlet to face of outlet	—	—	—	—	2-5/8	67	2-13/16	71
"D" $\varnothing$ outlet to face of inlet	—	—	—	—	1-15/16	49	1-7/8	48
"H"	—	—	—	—	3-1/16	78	3	76
Weight, lb (kg)	3/4 (0.4)		1 (0.5)		3/4 (0.4)		1 (0.5)	
Maximum Allowable Pressure (Vessel Design)	300 psig @ 450°F (20 bar @ 232°C)							
Maximum Operating Pressure, psi (bar)	300 (20)							
Discharge Orifice Size	3/16"							

### THERMOSTATIC STEAM TRAPS AND AIR ELIMINATORS - TH13A

#### DESCRIPTION

The TH 13A series thermostatic steam traps and air eliminators are specifically designed for use on process equipment such as kettle cookers, sterilizers, food, chemical and laundry equipment. The small size makes it ideal for use with a wide variety of this equipment and specifically as air eliminator.

Connections are female screwed.

#### MAIN FEATURES

- Modulating discharge.
- Discharges condensate close to steam temperature.
- Thermostats for different sub cooling (5°K to 30°K).
- Excellent air discharge.
- Simple and compact design.
- Built-in strainer.

USE: Saturated steam.

#### AVAILABLE

- MODELS: TH13A  
 SIZES: DN 1/2"  
 CONNECTIONS: Female screwed ISO 7/1 Rp (BS21)  
 INSTALLATION: Vertical installation, angle connection.

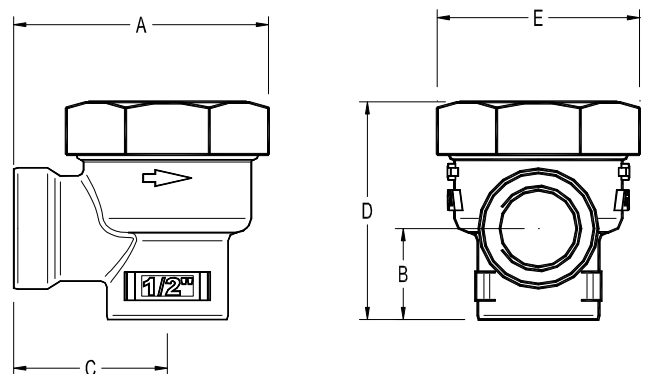
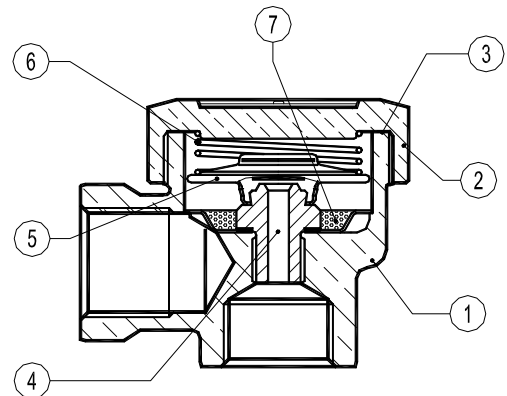
PMA – Max. allowable pressure	16	bar
TMA – Max. allowable temperature	260	°C
PMO – Max. operating pressure	13	bar
TMO – Max. operating temperature	200	°C
How to order: i.e. TH13A DN 1/2" BSP		

MATERIALS		
POS.N r.	DESIGNATION	MATERIAL
1	Body	Brass EN12165 / CuZn39Pb2
2	Cover	Brass EN12165 / CuZn39Pb2
3	* Gasket	St.St./Graphite
4	* Valve seat	AISI304 / 1.4301
5	* Thermostat	Stainless steel
6	* Spring	AISI302 / 1.4300
7	* Strainer screen	AISI304 / 1.4301

\* Available spare parts

FLOW RATE CAPACITY IN Kgs/h													
MODEL	SIZE	DIFFERENTIAL PRESSURE (bar)											
		0,2	0,3	0,5	1	1,5	2	3	4	6	8	10	13
TH13A	1/2"	45	55	70	95	125	135	180	200	270	315	330	360

Capacities shown refer to condensate at 10°C below saturated steam temperature (standard type-S thermostat) .  
 Thermostats for 5° C type-H and 30° type-L, also available.  
 Capacities for cold condensate discharge at 20°C are two to three times greater.



DIMENSIONS (mm)-Screwed						
SIZE DN	A	B	C	D	E	WGT. Kgs
1/2"	63	22,5	38	54	50	0,5

## Liquid Drainers

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32-LD Forged Steel Free Floating Guided Lever Drain Trap



1-LD Cast Iron Free Floating Guided Lever Drain Trap



11-LD Stainless Steel Free Floating Guided Lever Drain Trap

### Liquid Drainers ID Charts

Armstrong Liquid Drainers																
Illustration	Type	Flow Direction	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Model	Max. Oper. Press. psig	Connection Size						Located on Page	
									1/2"	3/4"	1"	1-1/4"	1-1/2"	2"		
	<b>Series 1-LDC</b> See-Thru Free Floating Lever Drain Traps Capacities to <b>1,500</b> lb/hr	↓	Screwed	150	150	Nylon Cap Polysulfone Body	<b>1-LDC</b>	150	●	★★					493	
	<b>Series 1-LDCW</b> See-Thru Free Floating Lever Drain Traps for Ozone Applications	↓	Screwed	150	150	PBT Cap (Polybutylene Terephthalate) Polysulfone Body	<b>1-LDCW</b>		▲	★★					495	
	<b>Series 200 BVS</b> Inverted Bucket Drain Traps Capacities to <b>7,000</b> lb/hr	↑	Screwed	250	450	ASTM A48 Class 30 Cast Iron	<b>211</b> <b>212</b> <b>213</b>	250	●	●					496	
	<b>Series 800 BVS</b> Inverted Bucket Drain Traps Capacities to <b>7,000</b> lb/hr	→	Screwed	250	450	ASTM A48 Class 30 Cast Iron	<b>800</b> <b>811</b> <b>812</b> <b>813</b>	150 250 250 250	●	●	●				496	
	<b>Series 880 BVS</b> Inverted Bucket Drain Traps Capacities to <b>7,000</b> lb/hr	→	Screwed	250	450	ASTM A48 Class 30 Cast Iron	<b>800</b> <b>881</b> <b>882</b> <b>883</b>	150 250 250 250	●	●	●				496	
	<b>Series 300 BVS</b> Inverted Bucket Drain Traps Capacities to <b>7,000</b> lb/hr	↑	Screwed Socketweld Flanged†	600 1,080	650 650	ASTM A105 Forged Steel	<b>312</b> <b>313</b>	600	●	●	●				496	
	<b>Series 900 BVS</b> Inverted Bucket Drain Traps Capacities to <b>7,000</b> lb/hr	→	Screwed Socketweld Flanged†	600	650	ASTM A216 WCB Cast Steel	<b>981</b> <b>983</b>	300 600	●	●	●				496	
	<b>Series 1, 2, 3, 6</b> Free Floating Lever Drain Traps Capacities to <b>49,000</b> lb/hr	↓	Screwed	300 250	200 450	ASTM A48 Class 30 Cast Iron	<b>1-LD</b> <b>2-LD</b> <b>3-LD</b> <b>4-LD</b>	300 250	★ ●	●	●			●	●	499

★ 1/4" outlet connection

★★ 1/2" outlet connection

† Flange selection may limit pressure and temperature rating.

†† Side connection not available.

## Liquid Drainers ID Charts

Armstrong Liquid Drainers															
Illustration	Type	Flow Direction	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Model	Max. Oper. Press. psig	Connection Size						Located on Page
									1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	
	<b>Series 11, 22, 13</b> Free Floating Lever Drain Traps  Capacities to <b>9,500</b> lb/hr	↓	Screwed Socketweld	500 or 440	100 or 500	304-L Stainless Steel	<b>11-LD††</b>	400	●	★★				500	
			Screwed Socketweld (22 and 13 Series Only)	600 or 475	100 or 500		<b>22-LD</b>	533	●						
				570 or 490	100 or 500		<b>13-LD</b>	570		●					
	<b>180-LD/181-LD</b> Free Floating Lever Drain Traps  Capacities to <b>1,100</b> lb/hr	↓	Screwed Socketweld	500 or 440	100 or 500	304L Stainless Steel	<b>180-LD</b>	229	●				502		
							<b>181-LD</b>	350		●					
	<b>Series 30</b> Free Floating Lever Drain Traps  Capacities to <b>42,000</b> lb/hr	↓	Screwed Socketweld Flanged†	600 or 500	100 or 750	ASTM A105 Forged Steel	<b>32-LD</b>	600	●	●	●		501		
				1,000 or 600	100 or 750		<b>33-LD</b>	900	●	●	●				
				1,000 or 600	100 or 750		<b>36-LD</b>	1,000			●	●			
	<b>Series 21</b> Fixed Pivot Drain Trap  Capacities to <b>2,700</b> lb/hr	↓	Screwed	250	450	ASTM A48 Class 30 Cast Iron	<b>21</b>	250	●	●					
	<b>Series 21-312</b> Fixed Pivot Drain Traps  Capacities to <b>3,900</b> lb/hr	↓	Screwed Socketweld Flanged†	600 or 500	100 or 750	ASTM A105 Forged Steel	<b>21-312</b>	74	●	●			504		
							<b>21-312V</b>	600	●	●					
	<b>Series 71-A</b> Snap Action Drain Trap  Capacities to <b>1,950</b> lb/hr	↓	Screwed	250	450	ASTM A48 Class 30 Cast Iron	<b>71-A</b>	250		●	●		504		
	<b>Series 71-315</b> Snap Action Drain Trap  Capacities to <b>1,950</b> lb/hr	↓	Screwed Socketweld Flanged†	1,000 or 600	100 or 750	ASTM A105 Forged Steel	<b>71-315</b>	1,000		●	●	●			
	<b>Series 2300</b> High Leverage Spring-Loaded Float Type Drain Trap  Capacities to <b>14,500</b> lb/hr	↓	Screwed Socketweld Flanged†	1,000 or 600	100 or 750	ASTM A105 Forged Steel	<b>2313-HLS</b>	1,000	●	●	●		506		
							<b>2315-HLS</b>				●	●		●	
							<b>2316-HLS</b>					●		●	●

† Flange selection may limit pressure and temperature rating.

### Liquid Drainers ID Charts

Armstrong Liquid Drainers																			
Illustration	Type	Flow Direction	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Model	Max. Oper. Press. psig	Connection Size							Located on Page			
									1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	3"				
	Series 2400 High Leverage Spring-Loaded Float Type Drain Traps Capacities to 16,250 lb/hr		Screwed Socketweld Flanged†	1,500 or 900	100 or 850	ASTM A182 Gr. F22 Forged Steel	2413-HLS	1,500	●	●	●					506			
				1,800 or 900	100 or 900		2415-HLS	1,800			●	●	●			506			
							2416-HLS	1,800					●	●					
	Series 2500/2600 High Leverage Spring-Loaded Float Type Drain Traps Capacities to 11,000 lb/hr		Screwed Socketweld Flanged†	2,120 or 1,700	100 or 900	ASTM A182 Gr. F22 Forged Steel	25133G HLS	2,120		●	●	●				506			
				2,520 or 2,000	100 or 900		25155G HLS	2,520			●	●	●						
				3,700 or 3,000	100 or 900		26155G HLS	3,700					●	●					
	Series 2, 3, 6 Free Floating Lever Dual Gravity Drain Traps Capacities to 40,000 lb/hr		Screwed	250	450	ASTM A48 Class 30 Cast Iron	2-DG	190	●	●						508			
							3-DG	250		●	●								
							6-DG	250				●	●						
	Series 30 Free Floating Lever Dual Gravity Drain Traps Capacities to 40,000 lb/hr		Screwed Socketweld Flanged†	600 or 500	100 or 750	ASTM A105 Forged Steel	32-DG	325	●	●	●					508			
				1,000 or 600	100 or 750		33-DG	700			●	●							
				1,000 or 600	100 or 750		36-DG	1,000					●	●					
	Series JD&KD Ultra-Capacity Drain Traps Capacities to 302,000 lb/hr		Screwed	300	650	ASTM A395 Ductile Iron	JD8	300*					●			510			
							KD8							●					
							KD10								●				
							KD12										●		
	Series L&M Ultra-Capacity Drain Traps Capacities to 700,000 lb/hr		Screwed	250	450	ASTM A48 Class 30 Cast Iron	L8	250*					●			510			
							L10								●				
							M12											●	
	Series LS&MS Ultra-Capacity Drain Traps Capacities to 700,000 lb/hr		Screwed Socketweld Flanged†	450	650	ASTM A216 WCB Cast Steel	LS8	450*					●			514			
							LS10								●				
							MS12											●	
	ADP-1 Pneumatically Operated Liquid Drainer Capacities to 1.5 lb liquid per cycle		Screwed	180	150	Aluminum ASTM B221 6061-T6511	ADP-1	180		●						514			

\*For different specific gravities, see table LD-33 on page LD-49.

†Flange selection may limit pressure and temperature rating.

## Free Floating Guided Lever Drain Traps

For Loads to 9,500 lb/hr (4,309 kg/hr)...Pressures to 570 psig (39 bar)

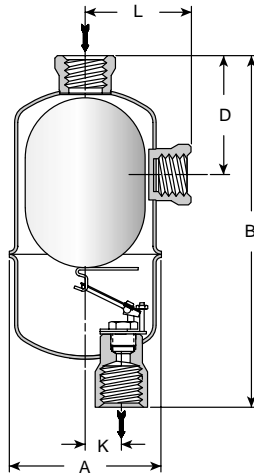
Armstrong's stainless steel, free-floating guided lever drain traps use the same bodies, caps, lever mechanisms, valves and seats of Armstrong inverted bucket steam traps that have been proven in years of service. Elliptical floats and high leverage make it possible to open large orifices to provide adequate capacity for drain trap size and weight.

The hemispherical valve, seat and leverage of the 11-LD, 22-LD and 13-LD stainless steel traps are identical in design, materials and workmanship to those for saturated steam service up to 570 psig (39 bar) with the exception of the addition of a guidepost to assure a positive, leaktight valve closing under all conditions.

### List of Materials

Model No.	Valve & Seat	Leverage System	Float	Body & Cap	Gasket
11-LD 22-LD 13-LD	Stainless Steel			Sealed Stainless Steel, 304L	—

For information on special materials, consult the Armstrong Application Engineering Department.



**Figure LD-34.**

No. 11-LD, 22-LD and 13-LD stainless steel guided lever liquid drain trap with sealed, tamperproof construction.



### Physical Data

Model No.	Stainless Steel					
	11-LD**		22-LD		13-LD	
Pipe Connections	in	mm	in	mm	in	mm
	3/4*	20*	3/4	20	1	25
"A"	2-3/4	70	3-15/16	100	4-1/2	114
"B"	7-1/4	184	8-13/16	224	11-3/8	289
"D"	—	—	3	76	6-1/8	156
"K"	9/16	14	7/8	22	1-3/16	30
"L"	—	—	2-5/8	67	3-9/32	83
Approx. Wt. lbs (kg)	1-3/4 (0.79)		3-1/4 (1.5)		7-1/2 (3.4)	
Max. Allowable Pressure (Vessel Design)	500 psig @ 100°F (35 bar @ 38°C) 440 psig @ 500°F (30 bar @ 260°C)		600 psig @ 100°F (41 bar @ 38°C) 475 psig @ 500°F (33 bar @ 260°C)		570 psig @ 100°F (39 bar @ 38°C) 490 psig @ 500°F (34 bar @ 260°C)	

**Note:** Vessel design pressure may exceed float collapse pressure in some cases.  
Pipe size of vent connection is same as that of inlet and outlet connections.  
\*1/2" (15 mm) outlet. \*\*No side connection.