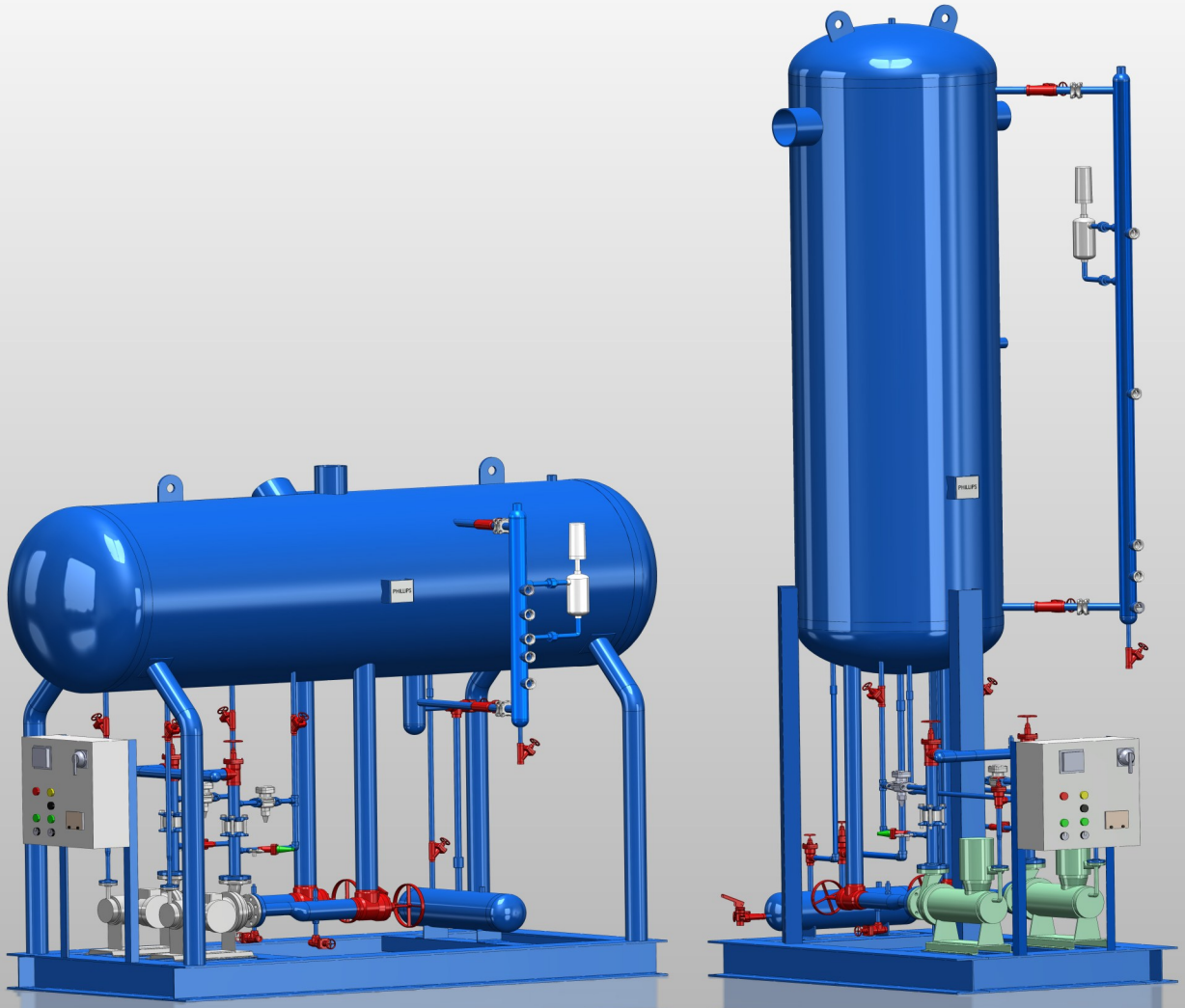
PHILLIPS REFRIGERATION

VESSELS & SYSTEMS

Phillips®

REFRIGERATION

VALVES • VESSELS • SYSTEMS • CONTROLS



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DeKalb, IL 60115

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Capabilities

Facility
Phillips has broad capabilities for both carbon and stainless steel. We offer a full-service machine shop complete with CNC Lathes, Mills, testing and assembly areas. Our welding and fabrication department has Waterjet plate cutting and CNC pipe cutting capabilities as well as Sub-Arc welding systems, Robotic welding and overhead cranes capable of handling small and large projects. See page 2 for more details.

ASME Certification
H.A. Phillips & Co. holds an ASME 'U' stamp and a National Board 'R' stamp. Our Quality Management System and welders are certified in accordance with the ASME Code Section VIII, Division 1. Every welder certification test is evaluated in accordance with Section IX of the ASME code by an outside authority. Furthermore, all ASME Code work is inspected by an independent agency prior to applying the U-stamp of approval.

ISO 9001 Certification
H.A. Phillips & Co. has been ISO certified since 2000. We are currently certified to ISO 9001:2015. The organization of H.A. Phillips & Co. is committed to being a preeminent global manufacturer of high quality welded, machined, electrical and electronically controlled products.

Pump Recirculation Packages
Phillips mechanical pump recirculation packages are available up to 144" diameter. Each pump recirculation package is custom designed and packages come standard with Phillips check valves and Danfoss hand valves. While Phillips and Danfoss valve options provide the most economical design, we can package with any valve brand per the customer's preference. We also package with customer's choice of Nikkiso, Teikoku or Cornell pumps.

Plate & Frame Chiller Packages
Factory-packaged plate and frame heat exchangers with surge drums, columns, oil pots and liquid makeup valve trains are available. We can provide the complete skid-mounted turnkey package with customer's choice of plate heat exchangers, or the customer can supply the heat exchanger and Phillips can provide the packaging. Either option reduces expensive field labor and increases quality by using our highly qualified fitters in a factory environment.

Gas Recirculation Systems
As a pioneer in gas-driven recirculation systems, Phillips continues to provide engineering assistance and vessel fabrication for these energy-and maintenance-efficient overfeed systems. Phillips engineers can size the CPR, Gas Recirculating System and High Side Control to meet your recirculation needs.

Engineering
Our engineering staff can help you custom-design the vessel or packaged system for your application in terms of storage capacity, liquid-vapor separation, pressure rating, nozzle sizing and mounting requirements.

CAD
We utilize the latest SolidWorks modeling software and can provide 3D models of vessels and systems upon request. Utilizing DriveWorks software, our engineers have developed a rapid quotation system integrated with SolidWorks that allows for the fastest quote turnaround in the industry and quick drawing turnaround for customer approval.

Valve Trains
H.A. Phillips can assist you by sub-assembling valve trains to ensure correct and fast installation at the job site. Phillips engineers will help you with your selection, whether you prefer solenoid, motorized valve, or Pulse-Width Modulated control. Danfoss ICF valve stations are also available from Phillips.

Level Columns
Let Phillips provide you with the level column for your vessel. We can supply you with 2", 2-1/2", and 3" diameter columns with Level Eye® sight glasses available with clear or reflex lenses, with or without frost shields, with drain and/or probe connections and float switch couplings. Options include factory mounted float switches, drain valves and valved and/or flanged vessel connections. Columns are available with rapid turnaround.

Danfoss Products
H.A. Phillips has been a reseller of Danfoss Industrial Refrigeration products for over 30 years. Our large inventory allows us to process orders quickly from a single item to a complete project. Danfoss valves come as standard on all our packaged systems.

Vessel Standards

Standard Features

- ASME Certification: All pressure vessels are designed, fabricated, tested, inspected and stamped in accordance with ASME Section VIII, Division 1 Pressure Vessel Code and are National Board registered.
- Maximum Allowable Working Pressure (MAWP): 250 PSI low side vessels, 300 PSI high side vessels from -20°F to +450°F. Dual stamped to -60°F at reduced pressure (unless otherwise noted). Other MAWPs and lower temperatures are available.
- Heads: 2:1 Semi-elliptical SA 516-70N carbon steel
- Shells: 24" diameter and smaller are SA 106 S/B or SA 53 E/B or S/B pipe. 30" diameter and larger are rolled SA 516-70 carbon steel plate.
- Lifting lugs are standard on all vessels 30" in diameter and larger
- Nozzle Materials: ASTM A-53 B and ASTM A-106B. ASTM A-333 Gr. 6 available where necessary.
- Nozzle Thickness: 2" and smaller are Schedule 80, larger than 2" are Schedule 40.
- Fittings: Class 3000
- Paint: 1 coat primer and 4-6 mils of engineered epoxy top coat

Available Options

- Stainless Steel construction
- Abrasive blasting (SSPC-SP 6)
- Radiography (X-Ray)
- Post Weld Heat Treat (PWHT)
- Nitrogen Charge
- Special Paint/Color

Table 2 - Separation Capacities of Separation Vessels, Tons of Refrigeration*

Nominal	Vertical Vessel				Horizontal Vessel†				Horizontal, Split Flow Baffle†°			
Diameter	-50ºF	-20ºF	0ºF	30ºF	-50ºF	-20ºF	0ºF	30ºF	-50ºF	-20ºF	0ºF	30ºF
8	7.8	11.8	15.0	21	3.8	5.9	7.5	11	6	9.2	12.5	18.2
10	12.3	18.7	24.0	34	6.2	9.4	12.0	17	10.1	15.0	20.6	29.0
12	17.6	27	34	48	8.8	14.0	17	24	13	19.0	26.0	37
14	22	33	42	58	11.4	17	21	29	18.5	28.0	37	52
16	28	43	55	77	14	22	28	39	24	37	48	68
18	36	55	70	98	18	28	35	49	31.5	48	63	88
20	44	68	87	121	22	34	44	61	39	59	77	108
24	63	97	124	173	31	49	62	87	56	85	110	154
30	100	153	196	273	50	77	98	137	89	136	175	245
36	145	222	284	397	72	111	142	199	130	198	255	356
42	199	304	389	543	99	152	195	272	178	272	350	489
48	261	399	511	713	130	200	256	357	234	358	459	642
54	329	501	643	897	164	251	322	449	295	450	579	808
60	407	621	797	1111	203	311	399	556	366	559	717	1001
72	586	892	1146	1598	293	446	573	799	526	804	1032	1440
84	797	1222	1567	2185	398	611	784	1093	716	1094	1404	1959
96	1045	1594	2044	2850	522	797	1022	1425	940	1436	1843	2570
108	1322	2015	2583	3603	661	1008	1292	1802	1189	1816	2330	3250
120	1630	2485	3186	4444	815	1243	1593	2222	1466	2240	2874	4008
144	2345	3586	4594	6413	1172	1793	2297	3207	2109	3223	4133	5764

*Assumes 96ºF liquid feed

†Horizontal capacity assumes max liquid level, including surge, at midpoint of vessel

°Split flow sizing is for suction accumulators and split flow surge drums. See page 34 for horizontal recirculator sizing.

Table 1 - Vessel Volumes

Nominal Diameter	Single 2:1 Head, ft^3	Shell ft^3/ft
6	0.043	0.205
8	0.086	0.360
10	0.177	0.573
12	0.276	0.818
14	0.352	0.994
16	0.500	1.31
18	0.684	1.67
20	0.907	2.07
24	1.44	2.95
30	2.67	4.67
36	4.45	6.78
42	6.86	9.28
48	10.0	12.2
54	13.8	15.3
60	18.7	19.0
72	31.4	27.3
84	49.1	37.3
96	72.0	48.7
108	101	61.6
120	137	75.9
144	234	110

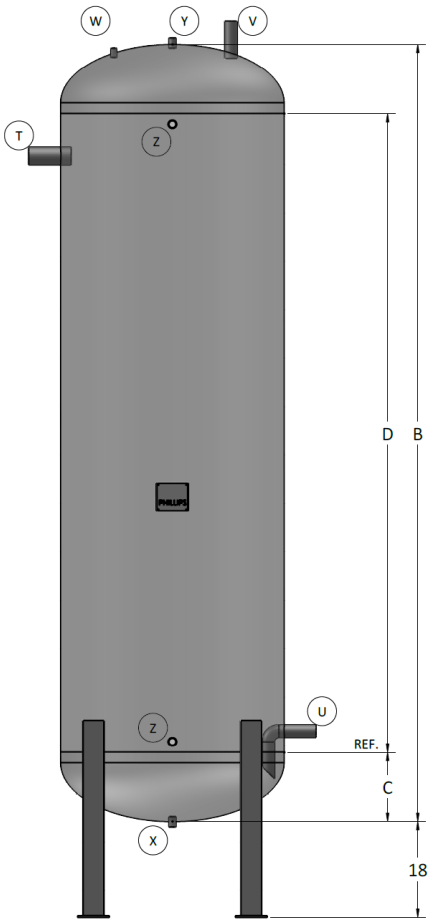
*Assumes thickness required for 250PSIG rating

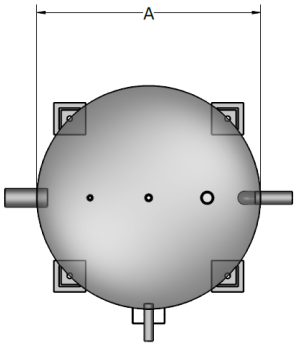
Table 3 - Various Nozzle Capacities, Tons of Refrigeration

IPS (in)	Liquid Leg*	Wet Suction Nozzle				Dry Suction Nozzle			
		-50	-20°F	0°F	30°F	-50	-20°F	0°F	30°F
¾	1	0.21	0.37	0.49	0.68	0.54	1.2	1.9	4.0
1	2	0.4	0.76	1	1.4	1	2.1	3.5	7.4
1-¼	4	0.9	1.6	2.1	2.9	2	4.2	7.0	15
1-½	6	1.4	2.4	3.2	4.5	2.9	6.2	10.1	21
2	11	3.4	5.8	7.7	11	5.5	12	19	41
2½	18	5.9	9.7	13	17	8.7	18	30	64
3	30	9.9	16	21	30	15	31	50	106
4	60	21	35	45	63	29	63	105	229
5	105	38	63	82	115	51	108	180	384
6	160	62	103	134	187	80	168	275	578
8	330	127	211	276	386	150	287	443	846
10	600	266	405	535	815	349	531	703	1070
12	925	416	633	837	1274	510	776	1027	1563
14	1150	531	808	1069	1628	628	956	1264	1924
16	1750	752	1144	1514	2303	843	1283	1697	2583
18	2400	998	1518	2009	3058	1097	1670	2210	3363
20	3186	1279	1946	2575	3919	1373	2090	2766	4209
24	5201	1943	2957	3912	5954	2039	3103	4106	6249

* Liquid line capacity doubles if integral oil pot larger than the liquid leg is used.

Vertical High Pressure Receiver



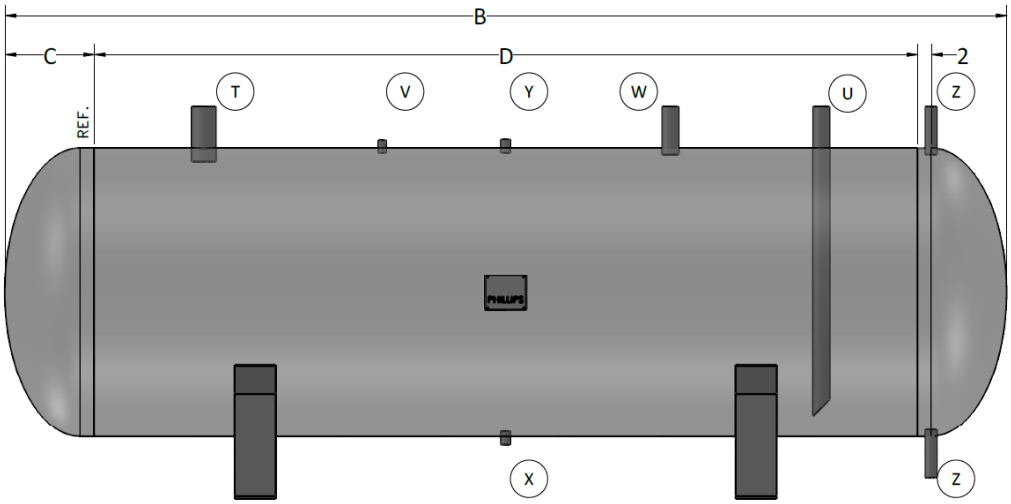


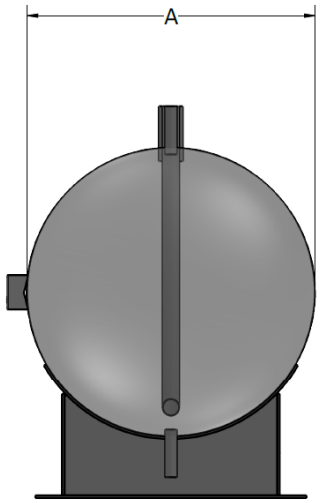
Model No.	A Dia.	B OAH	C Head	D Shell	T Liquid Inlet	U Liquid Outlet	V Equal	W Purge	X Drain	Y Relief	Z Column (Qty 2)	Est. Shipping Wt. (lbs.)	R-717 Capacity (lbs.)*
HPRV-20111	20	111	7½	96	1¼	¾	¾	¾	¾	¾	1¼	590	539
HPRV-20135	20	135	7½	120	1¼	1	1	¾	¾	¾	1¼	690	660
HPRV-20207	20	207	7½	192	1½	1	1	¾	¾	¾	1¼	1020	1025
HPRV-24137	24	137	8½	120	1½	1¼	1¼	¾	¾	¾	1¼	1210	950
HPRV-24209	24	209	8½	192	2	1½	1¼	¾	¾	¾	1¼	1780	1469
HPRV-30140	30	140	10	120	2½	1½	1½	¾	¾	¾	1¼	1590	1527
HPRV-30212	30	212	10	192	2½	1½	2	¾	¾	¾	1¼	2310	2349
HPRV-36143	36	143	11½	120	2½	1½	1½	¾	¾	¾	1¼	1940	2250
HPRV-36215	36	215	11½	192	3	2	2	¾	¾	¾	1¼	2810	3443
HPRV-42146	42	146	13	120	3	2	2	¾	¾	¾	1¼	2360	3125
HPRV-42218	42	218	13	192	3	2	2	¾	¾	¾	1¼	3370	4758
HPRV-48149	48	149	14½	120	3	2	2	¾	1	¾	1¼	2750	4166
HPRV-48221	48	221	14½	192	3	2	2	¾	1	¾	1¼	3910	6313
HPRV-54152	54	152	16	120	3	2	2	¾	1	¾	1¼	4140	5298
HPRV-54224	54	224	16	192	4	2½	2½	¾	1	¾	1¼	5880	7991
HPRV-60155	60	155	17½	120	4	2½	2½	¾	1	¾	1¼	4750	6671
HPRV-60227	60	227	17½	192	4	3	3	¾	1	¾	1¼	6680	10015
HPRV-72161	72	161	20½	120	4	3	3	¾	1	¾	1¼	7550	9851
HPRV-72233	72	233	20½	192	4	3	3	¾	1	1	1¼	10440	14656
HPRV-84167	84	167	23½	120	4	3	3	¾	1	¾	1¼	9250	13823
HPRV-84239	84	239	23½	192	5	4	4	¾	1	1	1¼	12630	20389
HPRV-84287	84	287	23½	240	6	5	5	¾	1	1¼	1¼	14890	24765
HPRV-96173	96	173	26½	120	6	5	5	¾	1	1	1¼	13420	18511
HPRV-96245	96	245	26½	192	8	5	5	¾	1	1¼	1¼	18050	27083
HPRV-96293	96	293	26½	240	8	5	5	¾	1	1¼	1¼	21130	32798

*Assuming 80% vessel capacity at 95°F

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Horizontal High Pressure Receiver



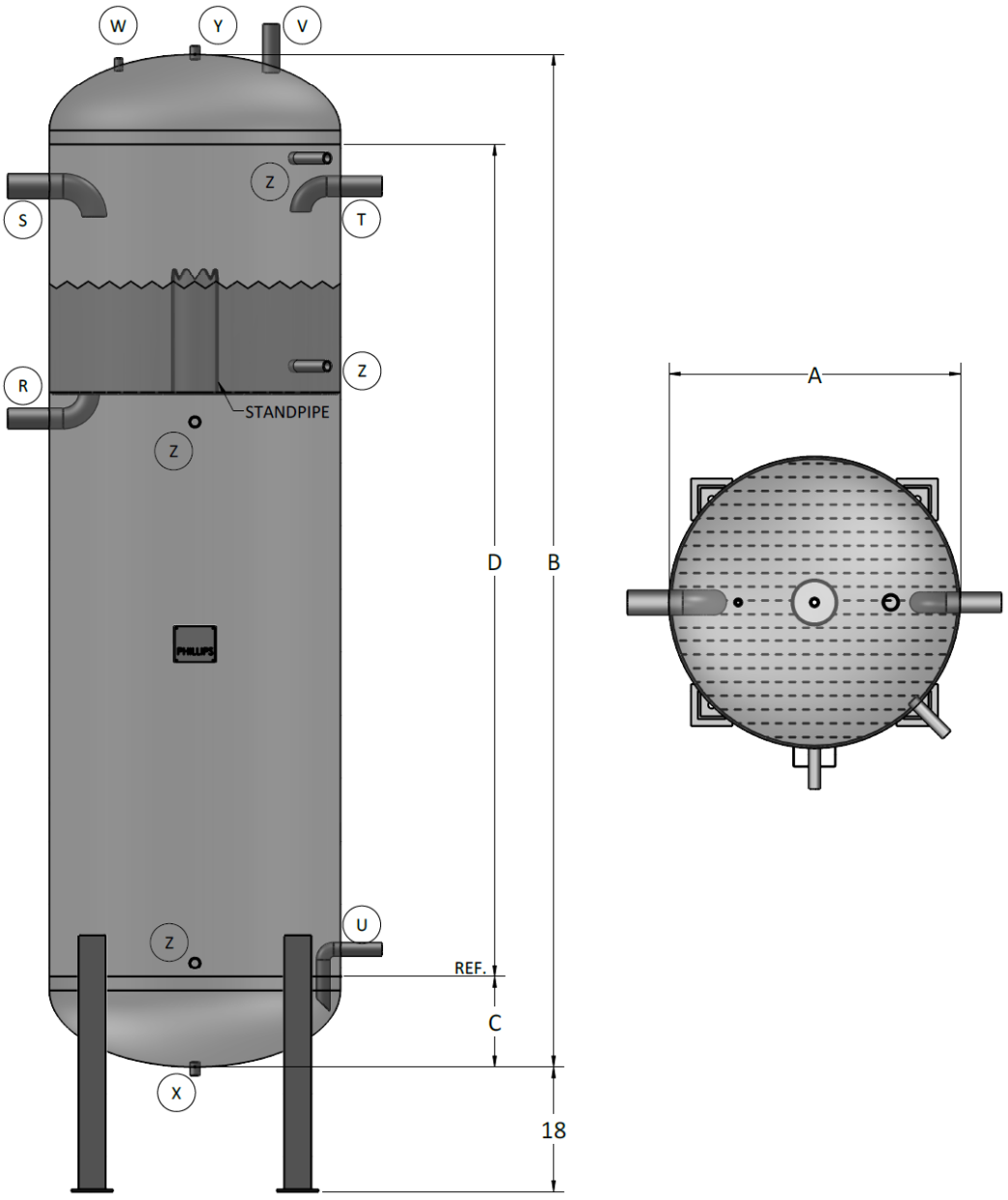


	A	B	C	D	T	U	V	W	X	Y	Z		
Model No.	Dia.	OAL	Head	Shell	Liquid Inlet	Liquid Outlet	Equal	Purge	Drain	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)	R-717 Capacity (lbs.)*
HPRH-20111	20	111	7½	96	1¼	¾	¾	¾	¾	¾	1¼	600	539
HPRH-20135	20	135	7½	120	1¼	1	1	¾	¾	¾	1¼	700	660
HPRH-24113	24	113	8½	96	1½	1¼	1¼	¾	¾	¾	1¼	1050	777
HPRH-24137	24	137	8½	120	1½	1¼	1¼	¾	¾	¾	1¼	1240	950
HPRH-30116	30	116	10	96	2	1¼	1¼	¾	¾	¾	1¼	1380	1253
HPRH-30140	30	140	10	120	2½	1½	1½	¾	¾	¾	1¼	1630	1527
HPRH-36119	36	119	11½	96	2	1½	1½	¾	¾	¾	1¼	1730	1852
HPRH-36143	36	143	11½	120	2½	1½	1½	¾	¾	¾	1¼	2020	2250
HPRH-42122	42	122	13	96	2½	1½	1½	¾	¾	¾	1¼	2120	2580
HPRH-42146	42	146	13	120	3	2	2	¾	¾	¾	1¼	2460	3125
HPRH-48149	48	149	14½	120	3	2	2	¾	1	¾	1¼	2890	4166
HPRH-48221	48	221	14½	192	3	2	2	¾	1	¾	1¼	4040	6313
HPRH-48269	48	269	14½	240	4	2½	2½	¾	1	¾	1¼	4820	7745
HPRH-54152	54	152	16	120	3	2	2	¾	1	¾	1¼	4280	5298
HPRH-54224	54	224	16	192	4	3	3	¾	1	¾	1¼	6030	7991
HPRH-54272	54	272	16	240	4	3	3	¾	1	¾	1¼	7180	9786
HPRH-60155	60	155	17½	120	4	2½	2½	¾	1	¾	1¼	4930	6671
HPRH-60227	60	227	17½	192	4	3	3	¾	1	¾	1¼	6860	10015
HPRH-60275	60	275	17½	240	4	3	3	¾	1	1	1¼	8150	12245
HPRH-72233	72	233	20½	192	5	3	3	¾	1	1	1¼	10490	14656
HPRH-72281	72	281	20½	240	5	4	4	¾	1	1	1¼	12440	17860
HPRH-84239	84	239	23½	192	5	4	4	¾	1	1	1¼	12770	20389
HPRH-84287	84	287	23½	240	6	4	4	¾	1	1¼	1¼	15020	24765
HPRH-96245	96	245	26½	192	6	4	4	¾	1	1¼	1¼	18140	27083
HPRH-96293	96	293	26½	240	8	4	4	¾	1	1¼	1¼	21220	32798

*Assuming 80% vessel capacity at 95°F

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

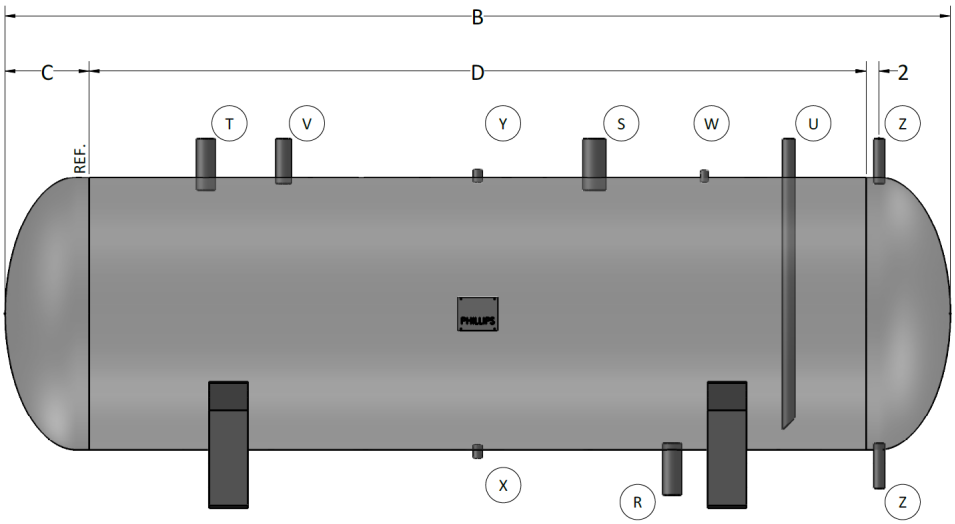
Vertical High Pressure Thermo-Syphon Receiver

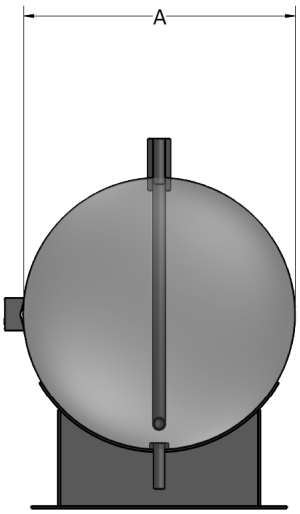


Model No.	A Dia.	B OAH	C Head	D Shell	R To Oil Cooler	S From Oil Cooler	Standpipe	T Liquid Inlet	U Liquid Outlet	V Equal	W Purge	X Drain	Y Relief	Z Column (Qty 4)	Est. Shipping Wt. (lbs.)
HPRTSV-20135	20	135	7½	120	1½	2	6"Ø x 18"	1¼	¾	1	¾	¾	¾	1¼	750
HPRTSV-24137	24	137	8½	120	2	2½	6"Ø x 18"	1½	1¼	1¼	¾	¾	¾	1¼	900
HPRTSV-30140	30	140	10	120	2	2½	6"Ø x 18"	2	1¼	1¼	¾	¾	¾	1¼	1680
HPRTSV-36143	36	143	11½	120	2½	3	6"Ø x 18"	2	1½	1½	¾	¾	¾	1¼	2050
HPRTSV-42146	42	146	13	120	2½	3	6"Ø x 18"	2½	1½	2	¾	¾	¾	1¼	2500
HPRTSV-48221	48	221	14½	192	3	4	6"Ø x 18"	3	2	2	¾	1	¾	1¼	4090
HPRTSV-54224	54	224	16	192	3	4	6"Ø x 18"	4	3	3	¾	1	¾	1¼	6100
HPRTSV-60227	60	227	17½	192	3	4	6"Ø x 18"	4	3	3	¾	1	¾	1¼	6940
HPRTSV-72281	72	281	20½	240	4	5	6"Ø x 18"	5	4	4	¾	1	1	1¼	12750
HPRTSV-84287	84	287	23½	240	5	6	8"Ø x 18"	6	4	4	¾	1	1¼	1¼	18240
HPRTSV-96293	96	293	26½	240	5	6	10"Ø x 18"	8	4	4	¾	1	1¼	1¼	21760

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Horizontal High Pressure Thermo-Syphon Receiver

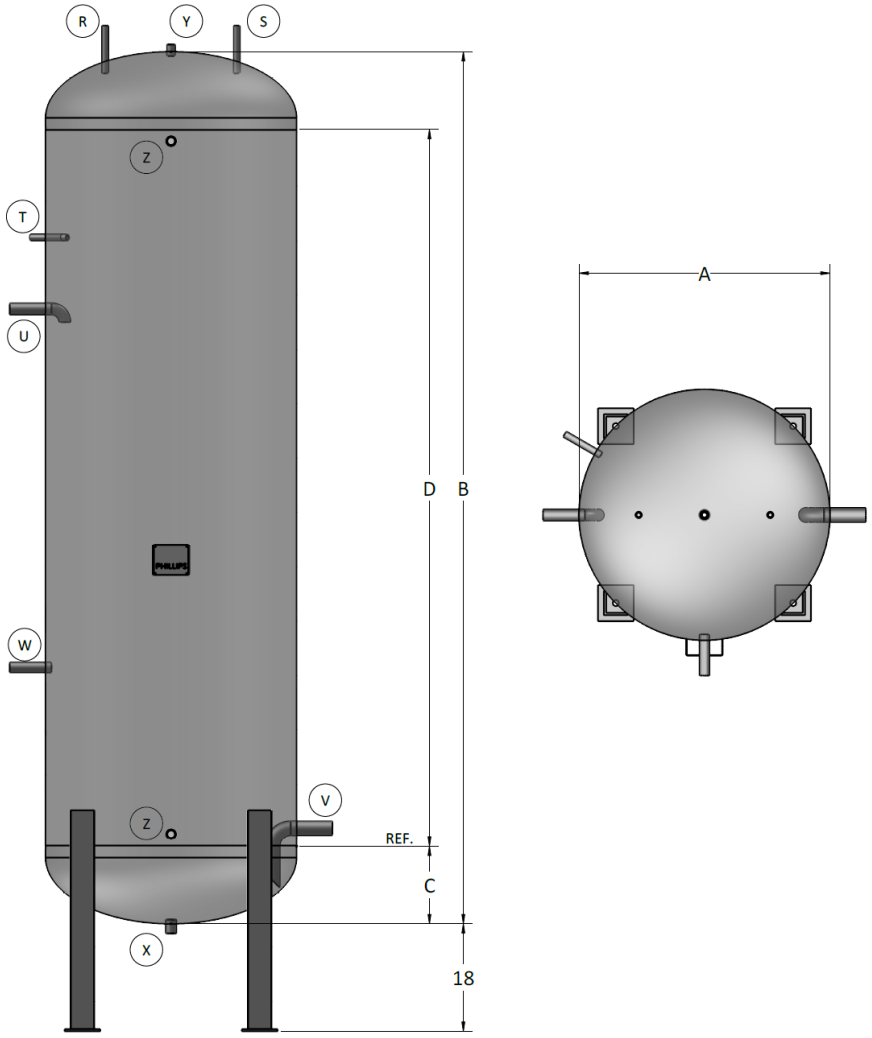




	A	B	C	D	R	S	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAL	Head	Shell	To Oil Cooler	From Oil Cooler	Liquid Inlet	Liquid Outlet	Equal	Purge	Drain	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)
HPRTSH-20135	20	135	7½	120	1½	2	1¼	¾	1	¾	¾	¾	1¼	690
HPRTSH-24137	24	137	8½	120	2	2½	1½	1¼	1¼	¾	¾	¾	1¼	1250
HPRTSH-30140	30	140	10	120	2	2½	2	1¼	1¼	¾	¾	¾	1¼	1630
HPRTSH-36143	36	143	11½	120	2½	3	2	1½	1½	¾	¾	¾	1¼	2020
HPRTSH-42146	42	146	13	120	2½	3	2½	1½	2	¾	¾	¾	1¼	2460
HPRTSH-48221	48	221	14½	192	3	4	3	2	2	¾	1	¾	1¼	4050
HPRTSH-54224	54	224	16	192	3	4	4	3	3	¾	1	¾	1¼	6060
HPRTSH-60227	60	227	17½	192	3	4	4	3	3	¾	1	¾	1¼	6870
HPRTSH-72281	72	281	20½	240	4	5	5	4	4	¾	1	1	1¼	12460
HPRTSH-84287	84	287	23½	240	5	6	6	4	4	¾	1	1¼	1¼	15040
HPRTSH-96293	96	293	26½	240	5	6	8	4	4	¾	1	1¼	1¼	21240

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

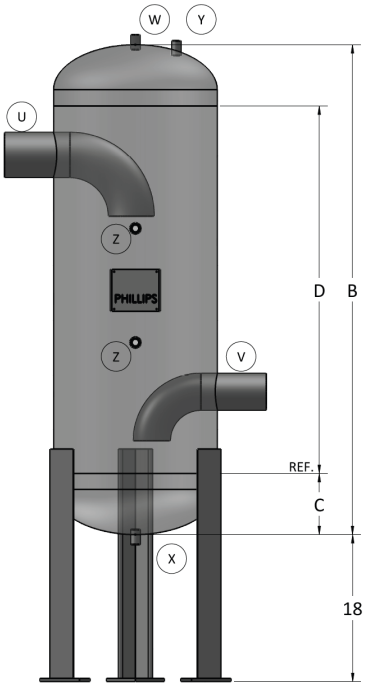
Vertical Controlled Pressure Receiver

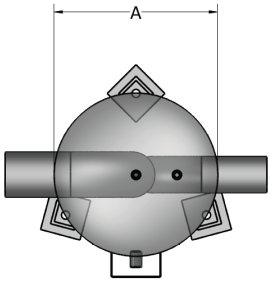


Model No.	A Dia.	B OAH	C Head	D Shell	R Gas Inlet	S Gas Outlet	T Oil Pot Vent	U Liq. Inlet	V Liq. Outlet	W Liq Trans. Inlet	X Drain	Y Relief	Z Column (Qty 2)	Est. Shipping Wt. (lbs.)
CPRV-20144	20	144	7½	129	¾	¾	¾	¾	1¼	¾	1	¾	1¼	740
CPRV-24144	24	144	8½	127	¾	¾	¾	1	1¼	¾	1	¾	1¼	1260
CPRV-24192	24	192	8½	175	¾	¾	¾	1¼	1½	¾	1	¾	1¼	1640
CPRV-30140	30	140	10	120	¾	¾	¾	1¼	1½	¾	1	¾	1¼	1590
CPRV-36143	36	143	11½	120	¾	¾	¾	1¼	2	¾	1	¾	1¼	1940
CPRV-42146	42	146	13	120	¾	¾	¾	1½	2	1¼	1	¾	1¼	2360
CPRV-48149	48	149	14½	120	¾	1¼	¾	2	2½	1¼	1	¾	1¼	2750
CPRV-48197	48	197	14½	168	¾	1¼	¾	2	2½	1¼	1	¾	1¼	3520
CPRV-54152	54	152	16	120	¾	1¼	¾	2	3	1¼	1	¾	1¼	4150
CPRV-54200	54	200	16	168	¾	1¼	¾	2	3	1¼	1	¾	1¼	5300
CPRV-60155	60	155	17½	120	¾	1¼	¾	2	3	2	1¼	¾	1¼	4750
CPRV-60203	60	203	17½	168	¾	1½	¾	2½	4	2	1¼	¾	1¼	6040
CPRV-72161	72	161	20½	120	¾	1½	¾	2½	4	2	1¼	¾	1¼	7550
CPRV-72209	72	209	20½	168	¾	2	¾	3	4	2	1¼	¾	1¼	9480
CPRV-84167	84	167	23½	120	¾	2	1	3	4	3	1½	¾	1¼	9260
CPRV-84215	84	215	23½	168	¾	2	1	3	4	3	1½	1	1¼	13690
CPRV-84239	84	239	23½	192	1	2	1	3	4	3	1½	1	1¼	15030
CPRV-96173	96	173	26½	120	1	2	1	3	4	3	1½	¾	1¼	13400
CPRV-96221	96	221	26½	168	1	2	1	3	5	3	1½	1	1¼	16490
CPRV-96245	96	245	26½	192	1	2½	1	4	5	3	1½	1	1¼	18030

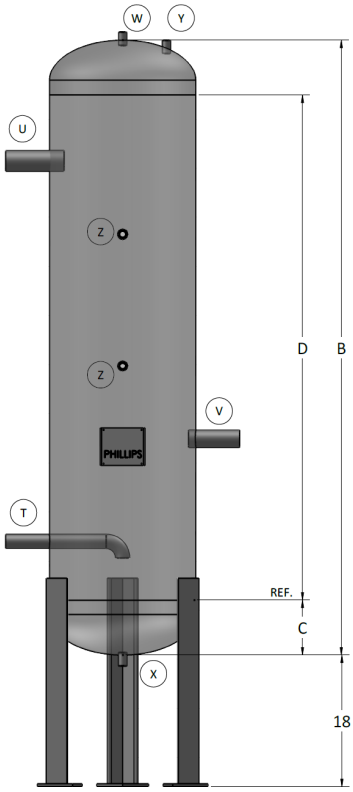
All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

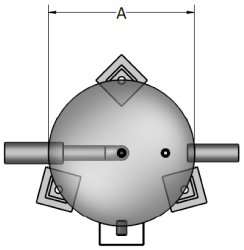
Pilot Receiver





Without Liquid Injection





With Liquid Injection

PILOT RECEIVER FOR HIGH SIDE CONTROL

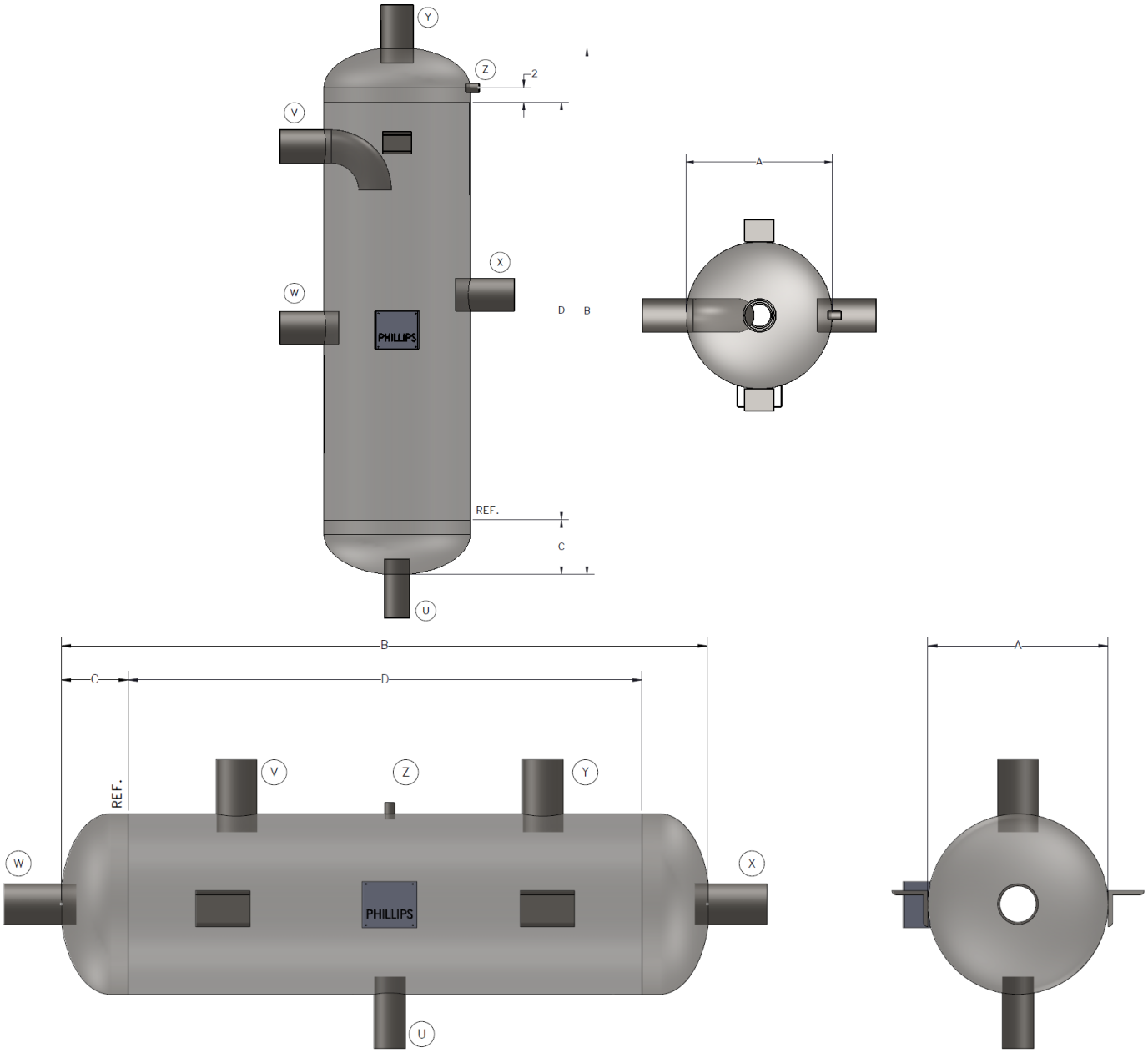
	A	B	C	D	U	V	W	X	Y	Z	
Model No.	Dia.	OAH	Head	Shell	Inlet	Outlet	Vent/ Purge	Drain	Relief	Float (Qty 2)	Est. Shipping Wt. (lbs.)
PRV-1248A	12	48	5½	37	¾	¾	¾	¾	½	¾	200
PRV-1248B	12	48	5½	37	1	¾	¾	¾	½	¾	200
PRV-1248C	12	48	5½	37	1¼	1	¾	¾	½	¾	200
PRV-1248D	12	48	5½	37	1½	1¼	¾	¾	½	¾	200
PRV-1248E	12	48	5½	37	2	1½	¾	¾	½	¾	200
PRV-1248F	12	48	5½	37	2½	2	¾	¾	½	¾	200
PRV-1648A	16	48	6½	35	3	2½	¾	¾	½	¾	250
PRV-1648B	16	48	6½	35	4	3	¾	¾	½	¾	250
PRV-2060A	20	60	7½	45	5	4	¾	¾	½	¾	380

PILOT RECEIVER FOR HIGH SIDE CONTROL WITH LIQUID INJECTION

	A	B	C	D	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAH	Head	Shell	Inj. Outlet	Inlet	Outlet	Vent/ Purge	Drain	Relief	Float (Qty 2)	Est. Shipping Wt. (lbs.)
PRIV-1272A	12	72	5½	61	1¼	¾	¾	¾	¾	½	¾	270
PRIV-1284B	12	84	5½	73	1¼	1	¾	¾	¾	½	¾	300
PRIV-1672C	16	72	6½	59	1¼	1¼	1	¾	¾	½	¾	330
PRIV-1684D	16	84	6½	71	1½	1½	1¼	¾	¾	½	¾	370
PRIV-1696E	16	96	6½	83	1½	2	1½	¾	¾	¾	¾	410
PRIV-2084F	20	84	7½	69	1½	2½	2	¾	¾	¾	¾	480
PRIV-2484A	24	84	8½	67	2	3	2½	¾	¾	¾	¾	800
PRIV-24120B	24	120	8½	103	2	4	3	¾	¾	¾	¾	1080
PRIV-30120A	30	120	10	100	2½	5	4	¾	¾	¾	¾	1400

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Thermo-Syphon Receiver



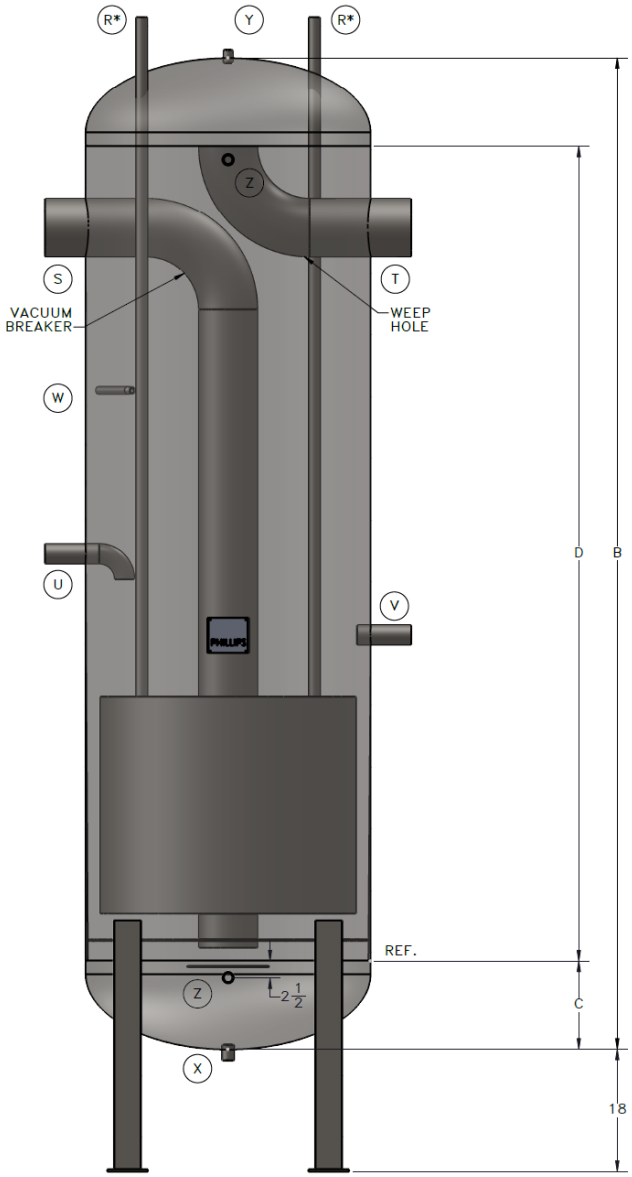
Model No.*	Heat of Rejection [Btu/min]**	A Dia.	B OAL/OAH	C Head	D Shell	U Oil Cooler Supply	V Oil Cooler Return	W Liq. Inlet	X Liq. Outlet	Y Vent	Z Relief	Est. Shipping Wt. (lbs.)
TSR0836V/H	1500	8	36	4	28	1¼	1½	1½	1½	1½	½	120
TSR1048V/H	3000	10	48	5	38	1½	2	2	2	1½	½	170
TSR1060V/H	4500	10	60	5	50	2	2½	2½	2½	2	½	200
TSR1272V/H	9000	12	72	5½	61	2	2½	3	3	2½	½	260
TSR1672V/H	15000	16	72	6½	59	2½	3	4	4	3	½	370
TSR2072V/H	22500	20	72	7½	57	3	4	4	4	4	¾	450
TSR2472V/H	30000	24	72	8½	55	4	5	5	5	4	¾	730
TSR3072V/H	45000	30	72	10	52	5	6	5	5	5	¾	920
TSR3084V/H	60000	30	84	10	64	5	6	6	6	5	¾	1040

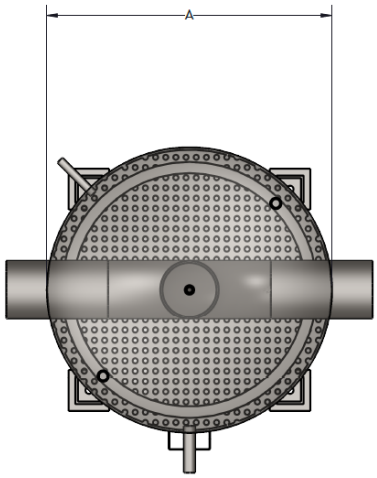
* Specify vertical or horizontal vessel by indicating "V" or "H" suffix in model number

** Capacities listed are for R-717. For R-22, multiply Heat of Rejection by 0.3

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Vertical Intercooler





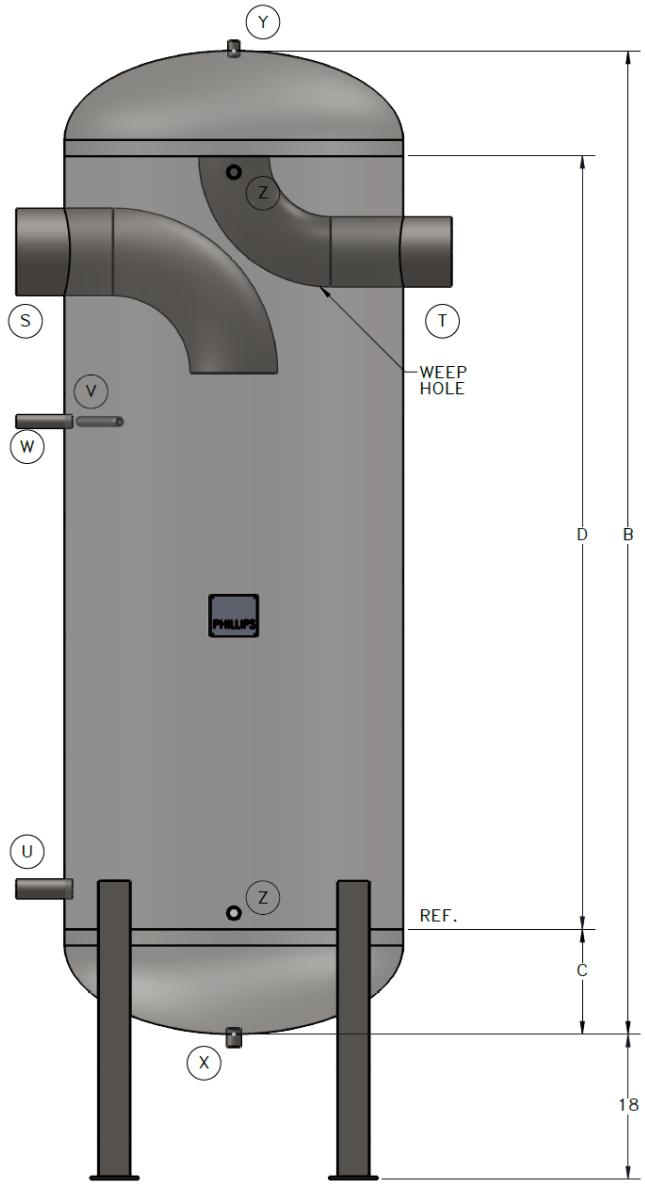
*COIL IS OPTIONAL

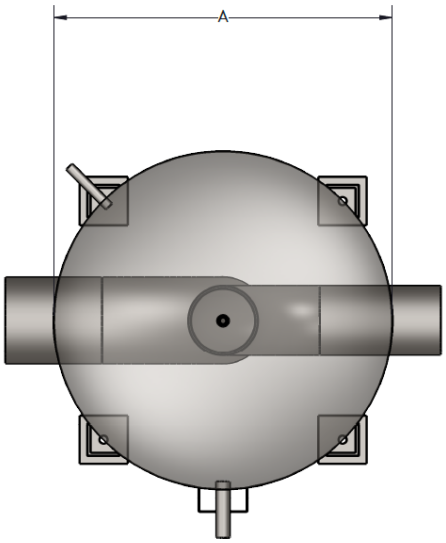
	A	B	C	D		R	S	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAH	Head	Shell	**OPTIONAL** Coil	**OPTIONAL** Coil Conn. (Qty 2)	Inlet	Outlet	Liquid Makeup	Liquid Out	Oil Pot Vent	Drain	Relief	Column (Qty 2)	*Est. Shipping Wt. (lbs.)
ICV-1696	16	96	6½	83	S-W,23.5T	¾	3	3	¾	¾	¾	1	¾	1¼	730
ICV-2096	20	96	7½	81	D-W,16.5T	¾	4	4	1	1	¾	1	¾	1¼	850
ICV-2496	24	96	8½	79	D-W,14.5T	1	5	5	1¼	1¼	¾	1	¾	1¼	1360
ICV-30116	30	116	10	96	D-W,15.5T	1¼	6	6	1½	1½	¾	1	¾	1¼	2250
ICV-36119	36	119	11½	96	D-W,17.5T	1¼	8	8	2	2	¾	1	¾	1¼	2990
ICV-42122	42	122	13	96	D-W,16.5T	1¼	8	8	2½	2½	¾	1	¾	1¼	3580
ICV-48149	48	149	14½	120	T-W,13.5T	1½	10	10	2½	2½	¾	1	¾	1¼	5350
ICV-54152	54	152	16	120	T-W,12.5T	2	10	10	3	3	¾	1	¾	1¼	7620
ICV-60155	60	155	17½	120	T-W,13.5T	2	12	12	3	3	¾	1¼	¾	1¼	9060
ICV-72161	72	161	20½	120	Q-W,16.5T	1½	14	14	4	4	¾	1¼	¾	1¼	12740
ICV-84167	84	167	23½	120	Q-W,17.5T	2	16	16	5	5	¾	1½	¾	1¼	15440
ICV-96173	96	173	26½	120	Q-W,18.5T	2½	18	18	5	5	¾	1½	¾	1¼	20360

*Optional coil included in estimated vessel shipping weight.

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Vertical Suction Accumulator (for use with transfer systems)

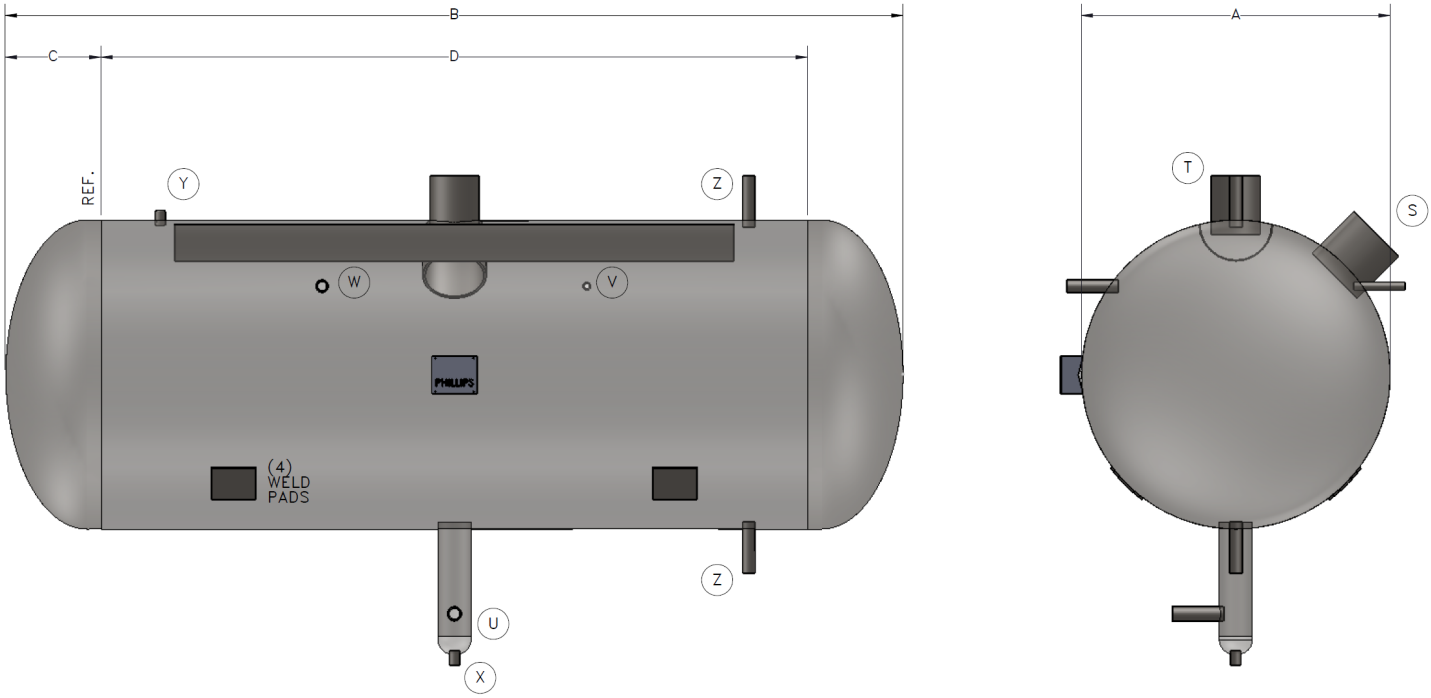




	A	B	C	D	S	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAH	Head	Shell	Suction Inlet	Suction Outlet	Liquid Out	Oil Pot Vent	3-Way Vent	Drain	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)
ACV-1272	12	72	5½	61	3	3	1¼	¾	¾	1	½	1¼	290
ACV-1696	16	96	6½	83	4	3	1¼	¾	¾	1	¾	1¼	440
ACV-2096	20	96	7½	81	5	4	1¼	¾	¾	1	¾	1¼	560
ACV-2496	24	96	8½	79	6	5	1¼	¾	¾	1	¾	1¼	950
ACV-30116	30	116	10	96	8	6	1½	¾	¾	1	¾	1¼	1450
ACV-36119	36	119	11½	96	10	8	2	¾	¾	1	¾	1¼	1830
ACV-42122	42	122	13	96	10	8	2	¾	¾	1	¾	1¼	2220
ACV-48149	48	149	14½	120	10	8	3	¾	1¼	1	¾	1¼	2970
ACV-54152	54	152	16	120	12	10	3	¾	1¼	1	¾	1¼	4470
ACV-60155	60	155	17½	120	12	12	3	¾	1¼	1¼	¾	1¼	5140
ACV-72161	72	161	20½	120	16	14	4	¾	1¼	1¼	¾	1¼	8130
ACV-84167	84	167	23½	120	18	16	4	1	1¼	1½	¾	1¼	10050
ACV-96173	96	173	26½	120	20	18	(2) 4	1	2	1½	¾	1¼	14440

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

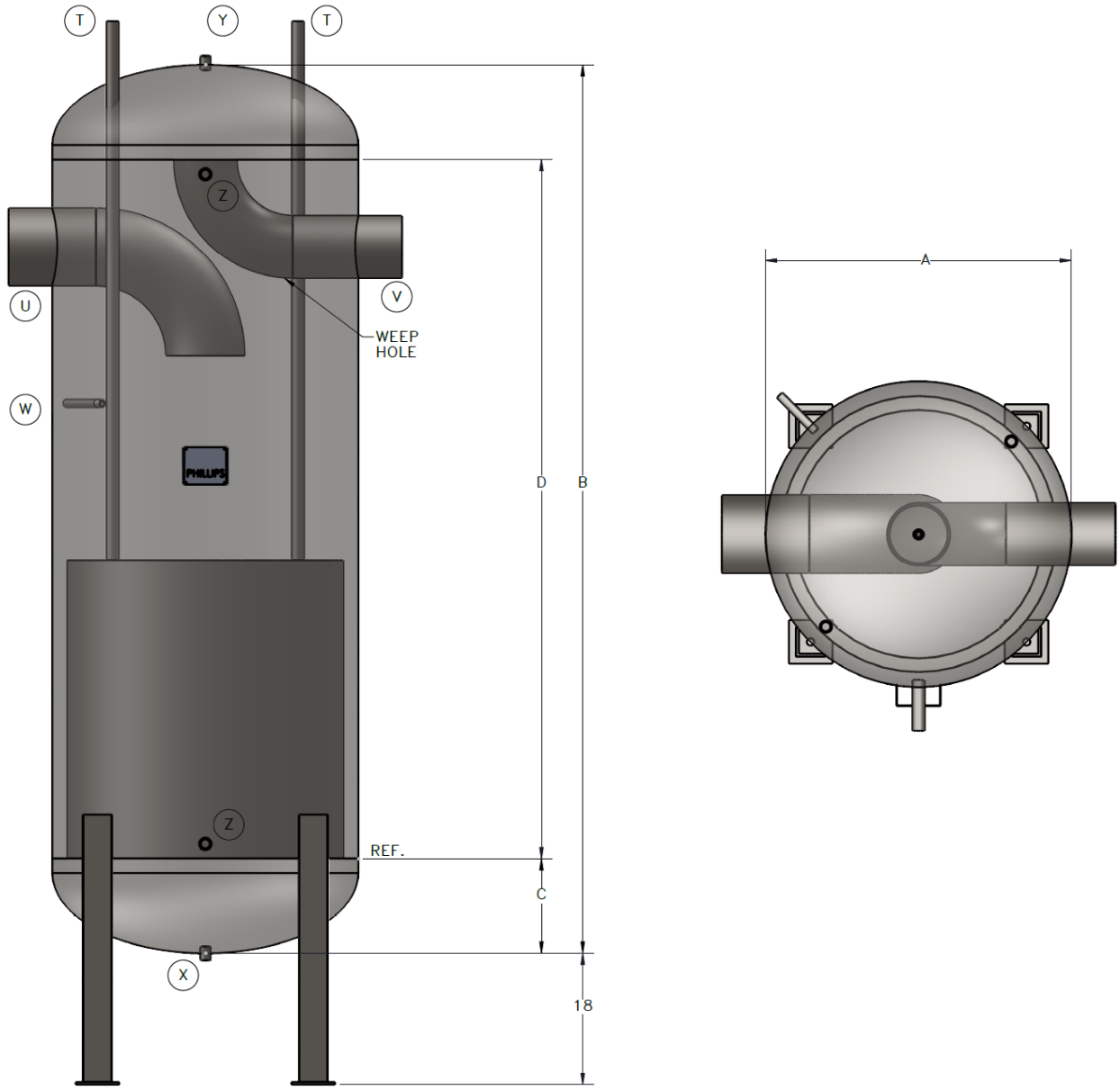
Horizontal Suction Accumulator (for use with transfer systems)



	A	B	C	D			S	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAL	Head	Shell	Sump Dia.	Sump Length	Gas Inlet	Gas Outlet	Liquid Out	Oil Pot Vent	3-Way Vent	Drain	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)
ACH-30140	30	140	10	120	4	18	6	5	1¼	¾	¾	1	¾	1¼	1880
ACH-36143	36	143	11½	120	4	18	8	6	1¼	¾	¾	1	¾	1¼	2250
ACH-42146	42	146	13	120	4	18	8	6	1½	¾	1¼	1	¾	1¼	2620
ACH-48149	48	149	14½	120	4	18	8	6	2	¾	1¼	1	¾	1¼	3000
ACH-54152	54	152	16	120	6	18	10	8	2	¾	1¼	1	¾	1¼	4490
ACH-60155	60	155	17½	120	6	18	10	8	2	¾	1¼	1¼	¾	1¼	5860
ACH-72161	72	161	20½	120	8	18	12	10	3	¾	1¼	1¼	¾	1¼	7830
ACH-84167	84	167	23½	120	8	20	12	12	3	1	1¼	1½	¾	1¼	9530
ACH-96173	96	173	26½	120	10	20	14	12	4	1	1¼	1½	¾	1¼	13390
ACH-108179	108	179	29½	120	10	20	16	14	4	1	1¼	1½	1	1¼	18180
ACH-120185	120	185	32½	120	10	20	18	16	4	1	1¼	1½	1	1¼	23980
ACH-144197	144	197	38½	120	12	20	20	18	(2) 4	1	2	1½	1¼	1¼	36270

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Vertical Suction Accumulator with Boil-Out Coil

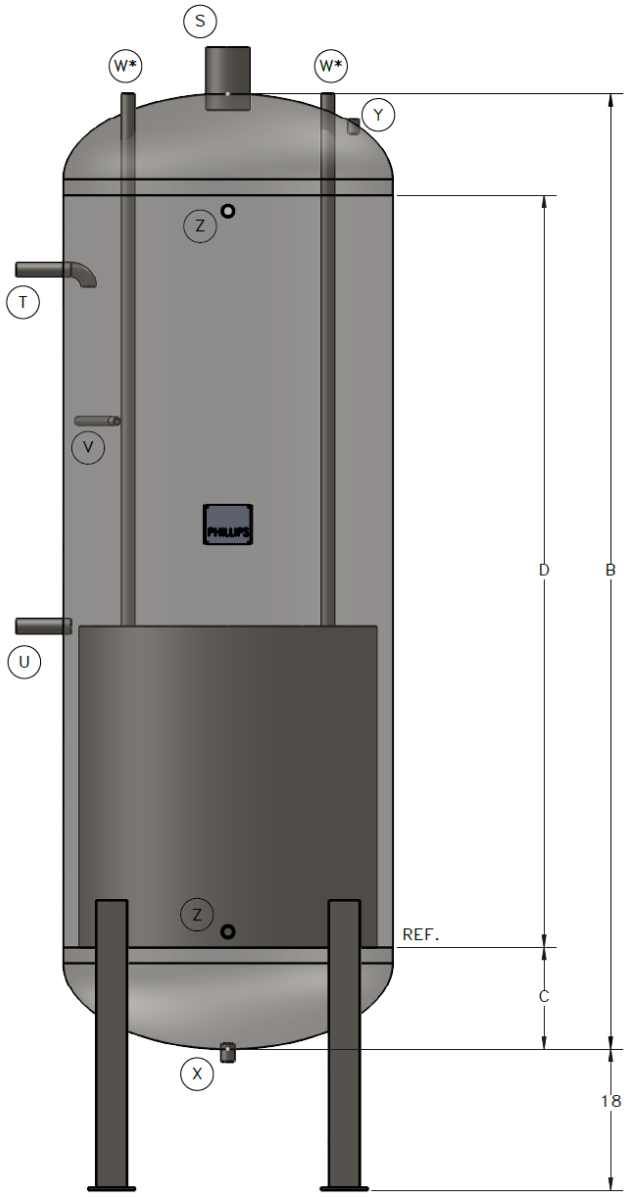


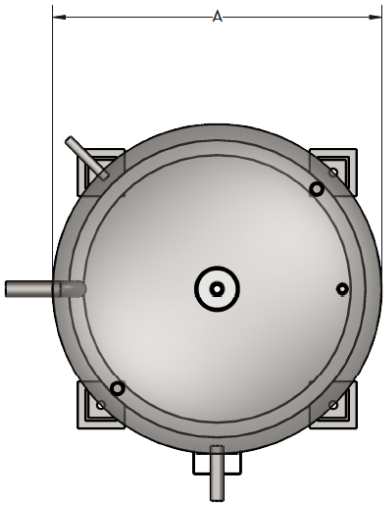
Model No.	A Dia.	B OAH	C Head	D Shell	Coil	Alternate Coil	T Coil Conn. (Qty 2)	U Suction Inlet	V Suction Outlet	W Oil Pot Vent	X Drain	Y Relief	Z Column (Qty 2)	*Est. Shipping Wt. (lbs.)
ACCV-1696	16	96	6½	83	S-W,17.5T		¾	4	3	¾	1	¾	1¼	640
ACCV-2096	20	96	7½	81	S-W,17.5T		1	5	4	¾	1	¾	1¼	780
ACCV-2496	24	96	8½	79	S-W,17.5T		1	6	5	¾	1	¾	1¼	1190
ACCV-30116	30	116	10	96	S-W,20.5T		1¼	8	6	¾	1	¾	1¼	1920
ACCV-36119	36	119	11½	96	S-W,20.5T		1½	10	8	¾	1	¾	1¼	2520
ACCV-42122	42	122	13	96	S-W,18.5T	D-W,13.5T	1½	10	8	¾	1	¾	1¼	2960
ACCV-48149	48	149	14½	120	S-W,17.5T	D-W,12.5T	2	10	8	¾	1	¾	1¼	3850
ACCV-54152	54	152	16	120	S-W,17.5T	D-W,13.5T	2	12	10	¾	1	¾	1¼	5450
ACCV-60155	60	155	17½	120	S-W,17.5T	D-W,14.5T	2	12	12	¾	1¼	¾	1¼	6230
ACCV-72161	72	161	20½	120	S-W,17.5T	D-W,14.5T	2	16	14	¾	1¼	¾	1¼	9220
ACCV-84167	84	167	23½	120	S-W,17.5T	D-W,14.5T	2	18	16	1	1½	¾	1¼	11140
ACCV-96173	96	173	26½	120	S-W,17.5T	D-W,14.5T	2	20	18	1	1½	¾	1¼	15540

*Single wound coil included in estimated vessel shipping weight.

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Economizer





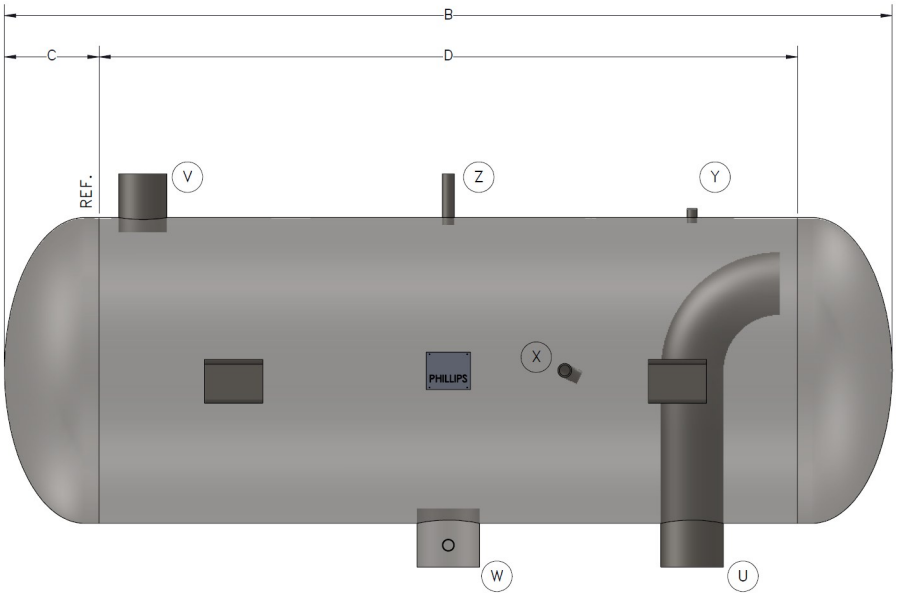
*COIL IS OPTIONAL

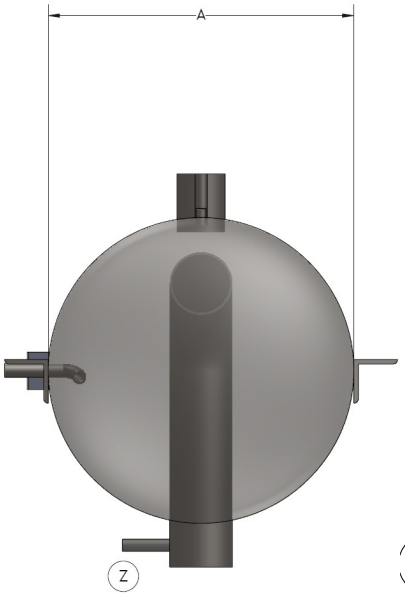
Model No.	A Dia.	B OAH	C Head	D Shell	Optional Coil	S Suction Outlet	T Liquid Inlet	U Liquid Outlet	V Oil Pot Vent	W Coil Conn. (Qty 2)	X Drain	Y Relief	Z Column (Qty 2)	Econ. Tons	Sys. Tons	*Est. Shipping Wt. (lbs.)
ECON-1084	10	84	5	74		¾	¾	¾	¾	½	1	½	1¼	7	43	260
ECON-1284	12	84	5½	73		1	¾	¾	¾	½	1	½	1¼	12	62	300
ECON-1696	16	96	6½	83	S-W,23.5T	1¼	1	1	¾	¾	1	¾	1¼	20	98	620
ECON-2096	20	96	7½	81	D-W,16.5T	1½	1	1	¾	¾	1	¾	1¼	31	155	720
ECON-2496	24	96	8½	79	D-W,14.5T	2	1	1	¾	1	1	¾	1¼	51	225	1130
ECON-30116	30	116	10	96	D-W,15.5T	2½	1½	1½	¾	1¼	1	¾	1¼	75	350	1820
ECON-36119	36	119	11½	96	D-W,17.5T	2½	1½	1½	¾	1¼	1	¾	1¼	75	508	2320
ECON-42122	42	122	13	96	D-W,16.5T	3	1½	1½	¾	1¼	1	¾	1¼	122	696	2750
ECON-48149	48	149	14½	120	T-W,13.5T	4	2	2	¾	1½	1	¾	1¼	203	913	3600
ECON-54152	54	152	16	120	T-W,12.5T	4	2	2	¾	2	1	¾	1¼	203	1150	5130
ECON-60155	60	155	17½	120	T-W,13.5T	5	2½	2½	¾	2	1¼	¾	1¼	308	1425	5840

System Tons at +55°F/+95°F
Economizer Tons based on suction outlet line size at +55°F/+95°F
*Optional coil included in estimated vessel shipping weight.

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Horizontal Surge Drum

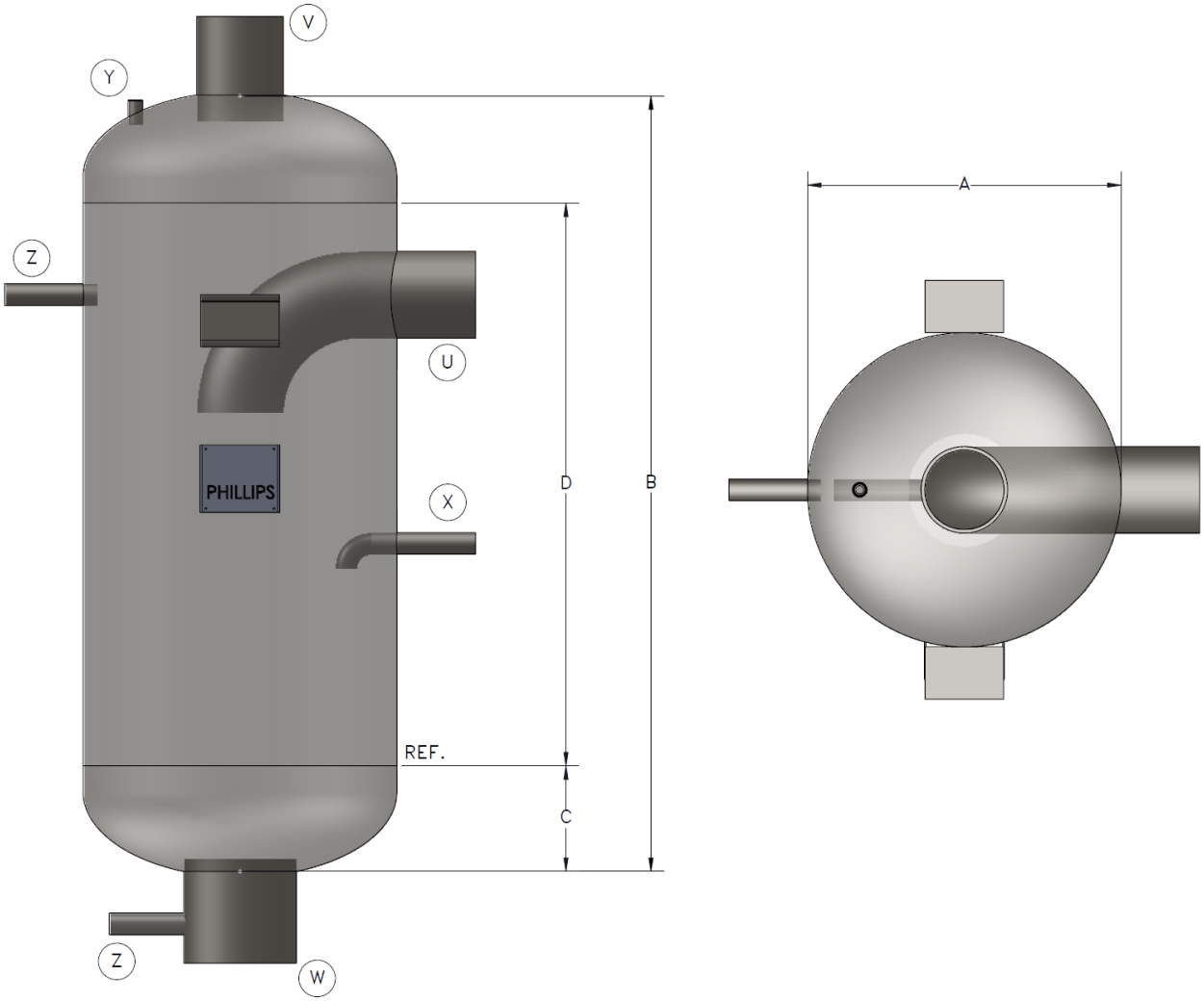




	A	B	C	D	U	V	W	X	Y	Z	
Model No.	Dia.	OAL	Head	Shell	Gas Inlet	Gas Outlet	Liquid Leg	Makeup	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)
SDH-12048	12	48	5½	37	2½	2	3	¾	½	1¼	200
SDH-16060	16	60	6½	47	3	2½	4	¾	½	1¼	330
SDH-20072	20	72	7½	57	4	3	4	¾	¾	1¼	450
SDH-24072	24	72	8½	55	4	4	4	1	¾	1¼	730
SDH-30092	30	92	10	72	5	4	5	1¼	¾	1¼	1140
SDH-36095	36	95	11½	72	6	5	6	1½	¾	1¼	1410
SDH-42122	42	122	13	96	8	6	8	1½	¾	1¼	2150
SDH-48149	48	149	14½	120	8	8	8	2	¾	1¼	2880
SDH-54152	54	152	16	120	8	8	8	2½	¾	1¼	4280
SDH-60155	60	155	17½	120	10	8	10	2½	¾	1¼	4920
SDH-72161	72	161	20½	120	10	10	10	3	¾	1¼	7660
SDH-84167	84	167	23½	120	12	10	12	3	¾	1¼	9480
SDH-96173	96	173	26½	120	12	12	12	4	¾	1¼	13350

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

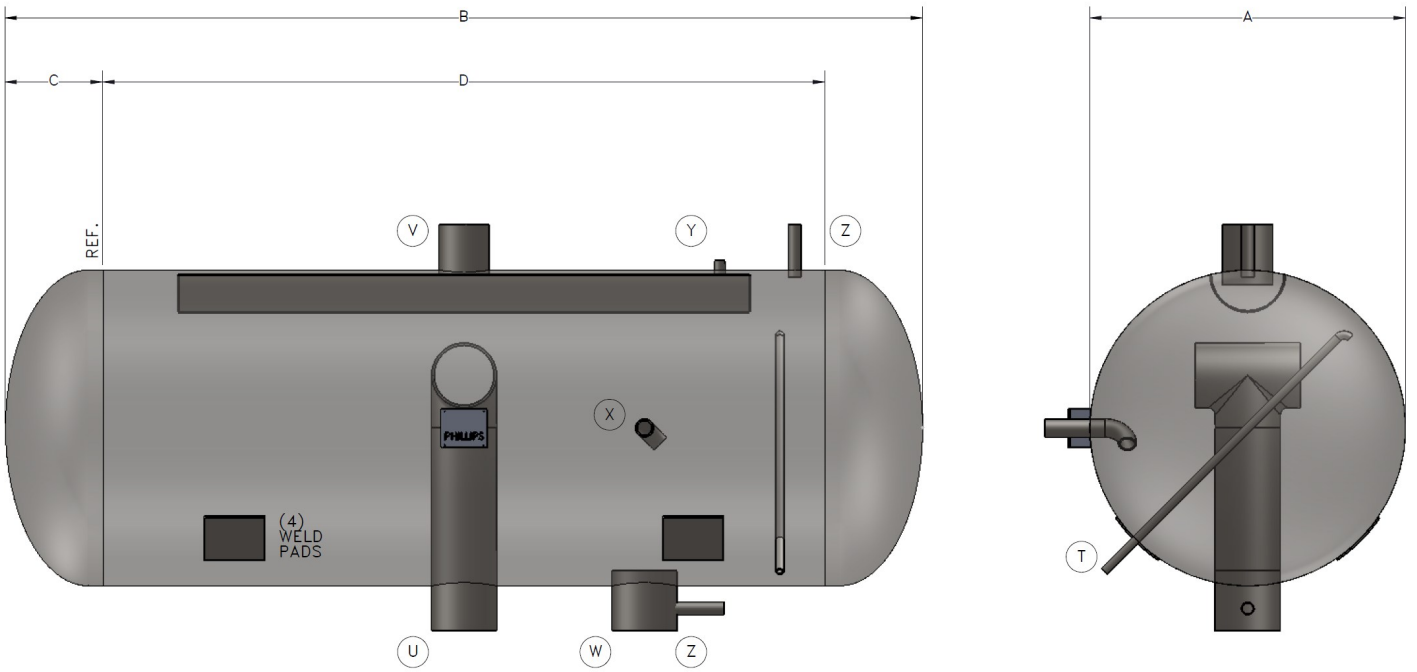
Vertical Surge Drum



Model No.	A Dia.	B OAH	C Head	D Shell	U Gas Inlet	V Gas Outlet	W Liquid Leg	X Makeup	Y Relief	Z Column (Qty 2)	Est. Shipping Wt. (lbs.)
SDV-12048	12	48	5½	37	4	3	4	¾	½	1¼	200
SDV-16054	16	54	6½	41	5	4	5	¾	½	1¼	370
SDV-20060	20	60	7½	45	6	5	6	1	½	1¼	370
SDV-24060	24	60	8½	43	6	6	8	1¼	¾	1¼	620
SDV-30080	30	80	10	60	8	8	8	1½	¾	1¼	1020
SDV-36083	36	83	11½	60	10	8	10	2	¾	1¼	1330
SDV-42098	42	98	13	72	10	8	10	2½	¾	1¼	1760
SDV-48125	48	125	14½	96	10	8	10	2½	¾	1¼	2480

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

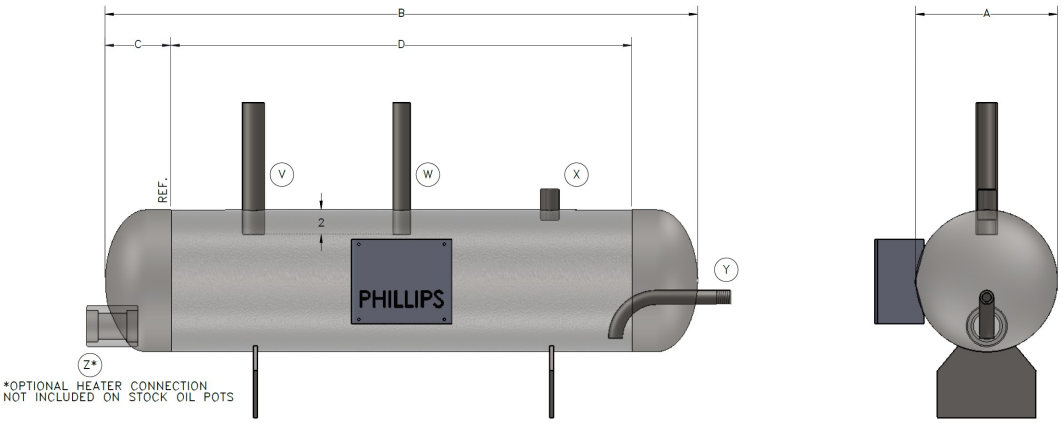
Horizontal Surge Drum - Split Flow Design



Model No.	A Dia.	B OAL	C Head	D Shell	T Oil Pot Vent	U Gas Inlet	V Gas Outlet	W Liquid Leg	X Makeup	Y Relief	Z Column (Qty 2)	Est. Shipping Wt. (lbs.)
SFSDH-12048	12	48	5½	37	¾	4	3	4	¾	½	1¼	200
SFSDH-16060	16	60	6½	47	¾	4	3	4	¾	½	1¼	290
SFSDH-20072	20	72	7½	57	¾	5	4	5	1	¾	1¼	430
SFSDH-24072	24	72	8½	55	¾	6	5	6	1¼	¾	1¼	770
SFSDH-30092	30	92	10	72	¾	8	6	8	1½	¾	1¼	1340
SFSDH-36095	36	95	11½	72	¾	8	6	8	1½	¾	1¼	1600
SFSDH-42122	42	122	13	96	¾	10	8	10	2	¾	1¼	2440
SFSDH-48149	48	149	14½	120	¾	10	8	10	2½	¾	1¼	3270
SFSDH-54152	54	152	16	120	¾	10	10	10	2½	¾	1¼	4790
SFSDH-60155	60	155	17½	120	¾	12	10	12	3	¾	1¼	5460
SFSDH-72161	72	161	20½	120	¾	14	12	14	4	¾	1¼	8260
SFSDH-84167	84	167	23½	120	1	16	16	16	4	¾	1¼	10390
SFSDH-96173	96	173	26½	120	1	18	16	18	5	¾	1¼	14350

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Oil Pots/Level Eye® Column



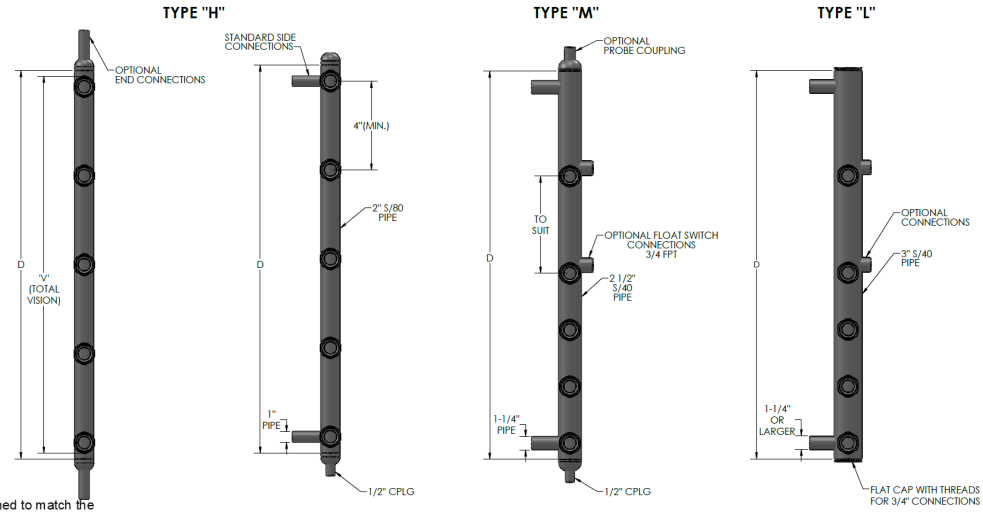
Model No.	A Dia.	B OAL	C Head	D Shell	V Inlet	W Vent	X Relief	Y Drain	Z Heater*	Est. Shipping Wt. (lbs.)
6P	6	36	3½	29	1½	¾	½	¾	1	70
8P	8	36	4	28	1½	¾	½	¾	2	90
8P-SS	8	36	4	28	1½	¾	½	¾	2	98
10P	10	36	5	26	2	¾	½	¾	2	110
12P	12	36	5½	25	2	1	½	¾	2	130

*Optional heater connection - Not included on stock oil pots

Phillips stock oil pots

- 4 sizes of standard design oil pots, 6"x36", 8"x36", 10"x36", 12"x36"
- Stock oil pot nozzles are as shown in table above, less the heater coupling
- 8P-SS constructed of stainless steel material
- Standard rating is -50ºF @ 400 PSI
- Sold in 3 trim levels, identified by the following suffix:
  - PA - Oil pot only
  - PB - Oil Pot with 250 PSI relief valve
  - PC - Oil pot with 250 PSI relief valve, inlet & vent globe valves, drain valve train including stop valve and spring-return valve
  - Example: 8" stock design oil pot with all accessories: 8PC

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions



All columns are individually designed to match the

Column Model Number:

6	L	- 126	

- No. of Level Eyes®
- Column Type:
  - H
  - M
  - L
- Column Length, inches
- Connection Location:
  - (Blank): Side connections
  - E: End Connections

Example: 6L-126: 3" diameter, 126" long, (6) Level Eyes®, side connections

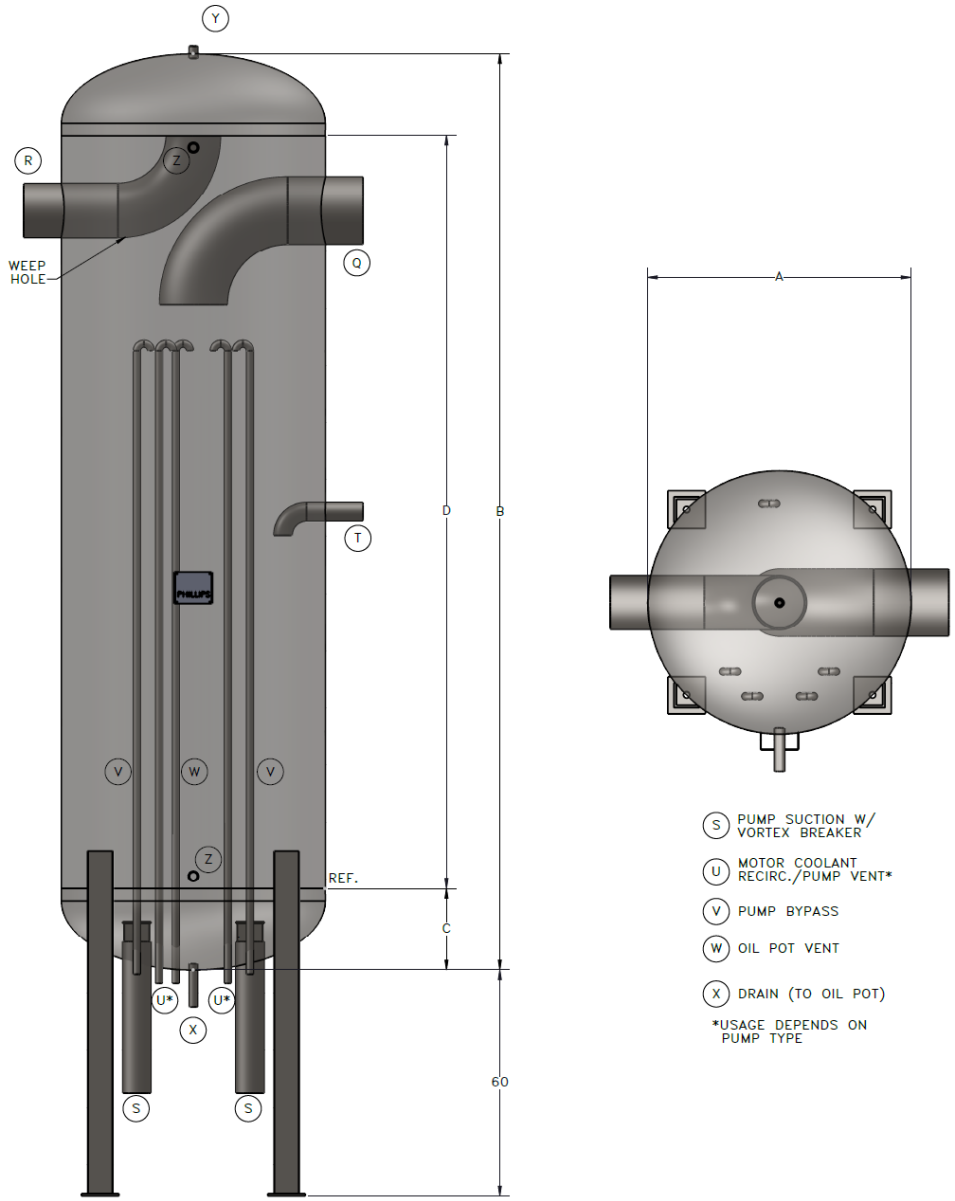
Type and Function:	Vessel range	Typical Setup
Type H: Made with 2" Sch 80 pipe	High temperature (>80ºF)	Level Eye® spacing 6"-12", side connections to vessel, drain coupling
Type M: Made with 2-1/2" Sch 40 pipe	Mid temperature (0ºF - 125ºF)	Level Eye® spacing 6"-12", side connections to vessel, drain coupling, frost shields when temperature<32ºF
Type L: Made with 3" Sch 40 pipe	Low temperature (-40ºF - 32F)	(5) Level Eyes® with frost shield (extended frost shield for temperature <-20ºF), (1) set float switch couplings

Available options:

- Clear glass or reflex lens
- Frost shield or extended frost shield
- Stainless Steel Column/Level Eyes®
- Float switch connections (2 per set)
- Drain coupling
- 3/4" Level probe coupling

Specify options when ordering

Vertical Pump Recirculator

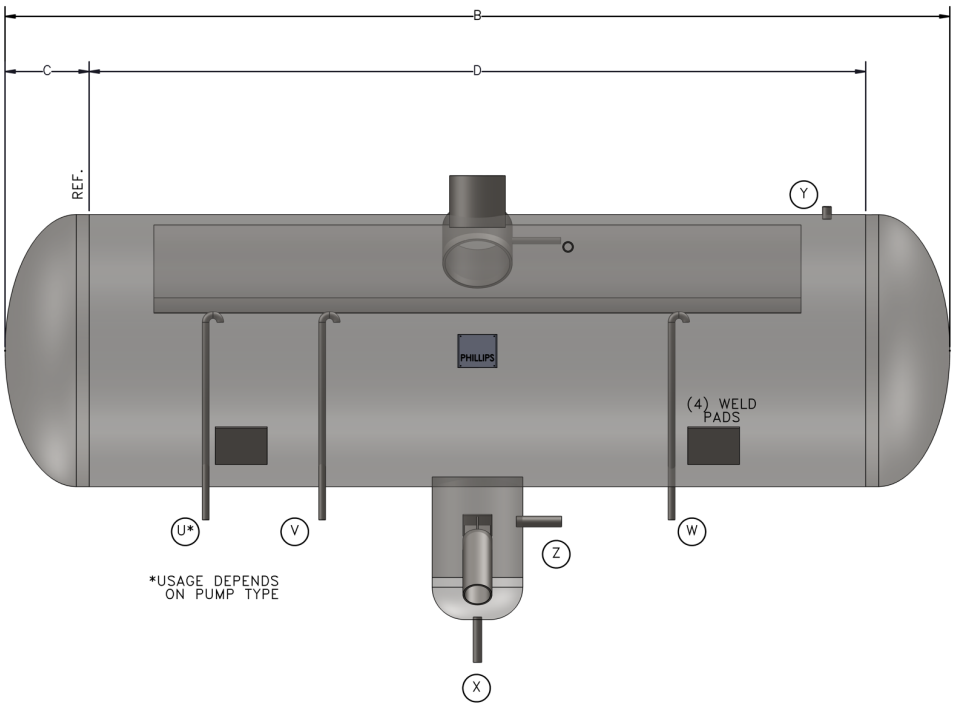


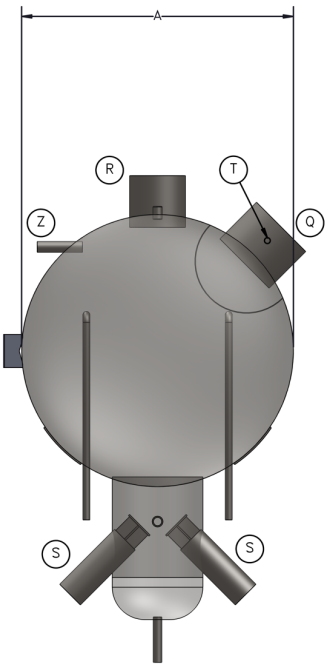
	A	B	C	D	Q	R	S	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAH	Head	Shell	Suction Inlet	Suction Outlet	Pump Suction	Makeup	Pump Vent/Recirc (Qty 2)	Pump Bypass (Qty 2)	Oil Pot Vent	Drain†	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)
RVV-24113	24	113	8½	96	6	5	4	1¼	¾	¾	¾	1	¾	1¼	1300
RVV-30116	30	116	10	96	8	6	4	1½	¾	¾	¾	1	¾	1¼	1700
RVV-36119	36	119	11½	96	8	6	4	2	¾	¾	¾	1	¾	1¼	2020
RVV-42146	42	146	13	120	10	8	4	2½	¾	¾	¾	1	¾	1¼	2880
RVV-48149	48	149	14½	120	10	10	4	2½	¾	¾	¾	1	¾	1¼	3330
RVV-54152	54	152	16	120	12	10	5	3	¾	¾	¾	1	¾	1¼	4800
RVV-60155	60	155	17½	120	12	12	5	3	¾	1	¾	1¼	¾	1¼	5520
RVV-72161	72	161	20½	120	16	14	6	4	¾	1	¾	1¼	¾	1¼	8600
RVV-84167	84	167	23½	120	18	16	8	5	¾	1¼	1	1½	¾	1¼	10610
RVV-96173	96	173	26½	120	20	18	8	5	¾	1¼	1	1½	¾	1¼	15220
RVV-108179	108	179	29½	120	20	20	10	6	¾	1¼	1	1½	1	1¼	20200
RVV-120185	120	185	32½	120	24	24	10	6	¾	1½	1	1½	1	1¼	26840
RVV-144197	144	197	38½	120	24	24	12	8	¾	1½	1	1½	1¼	1¼	39970

†For temperatures below -20° oil drain size is 1-1/2"

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Horizontal Pump Recirculator





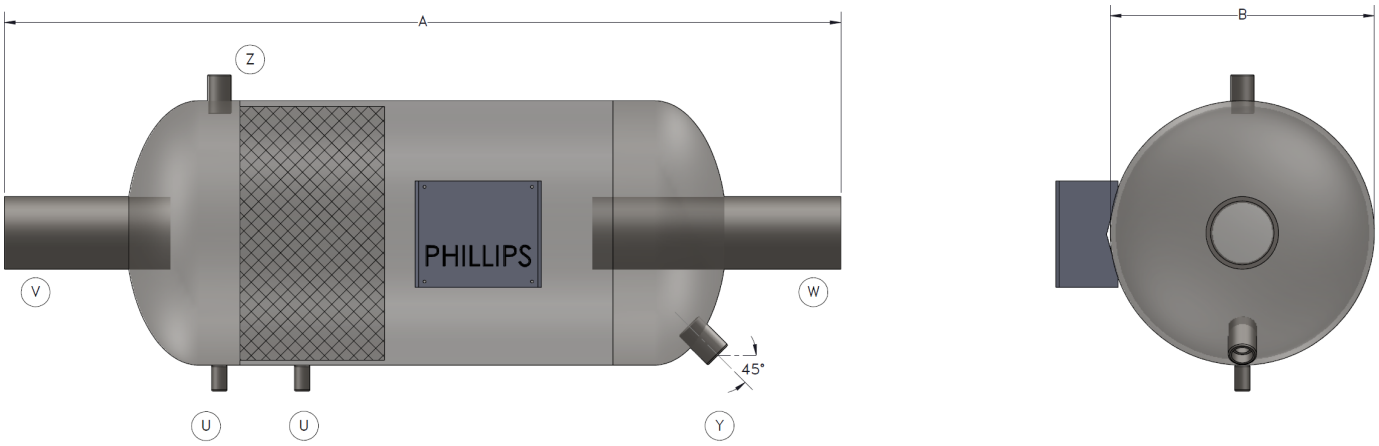
	A	B	C	D	I	J	Q	R	S	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAL	Head	Shell	Drop Leg Dia.	Drop Leg Len.	Suction Inlet	Suction Outlet	Pump Suction	Makeup	Pump Vent/Recirc (Qty 2)	Pump Bypass (Qty 2)	Oil Pot Vent	Oil Drain†	Relief	Column (Qty 2)	Est. Shipping Wt. (lbs.)
RVH-24137	24	137	8½	120	8	12	6	5	4	1¼	¾	¾	¾	1	¾	1¼	1580
RVH-30140	30	140	10	120	10	12	8	6	4	1½	¾	¾	¾	1	¾	1¼	2020
RVH-36143	36	143	11½	102	12	12	8	6	4	1½	¾	¾	¾	1	¾	1¼	2370
RVH-42146	42	146	13	120	14	12	10	8	4	2	¾	¾	¾	1	¾	1¼	2880
RVH-48149	48	149	14½	120	14	12	10	8	4	2½	¾	¾	¾	1	¾	1¼	3260
RVH-54152	54	152	16	120	16	12	10	10	4	2½	¾	1	¾	1	¾	1¼	4660
RVH-60155	60	155	17½	120	4	12	12	10	5	3	¾	1	¾	1¼	¾	1¼	5300
RVH-72161	72	161	20½	120	4	12	14	12	6	4	¾	1	¾	1¼	¾	1¼	8020
RVH-84167	84	167	23½	120	4	12	16	16	8	4	¾	1	1	1½	¾	1¼	9840
RVH-96173	96	173	26½	120	4	12	18	16	8	5	¾	1¼	1	1½	¾	1¼	13290
RVH-108179	108	179	29½	120	4	12	20	18	8	5	¾	1¼	1	1½	1	1¼	18020
RVH-120185	120	185	32½	120	4	12	24	20	10	6	¾	1½	1	1½	1	1¼	23730
RVH-144197	144	197	38½	120	4	12	24	24	12	8	¾	1½	1	1½	1¼	1¼	36430

†For temperatures below -20° oil drain size is 1-1/2"

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Dry Oil Separator

The Phillips DOS models are simple, economical, low-pressure drop oil separators with permanent stainless steel wire mesh pads that effectively collect oil. These separators are well-suited for use with the Phillips 270A float valve for returning oil to the crankcase (or oil receiver).



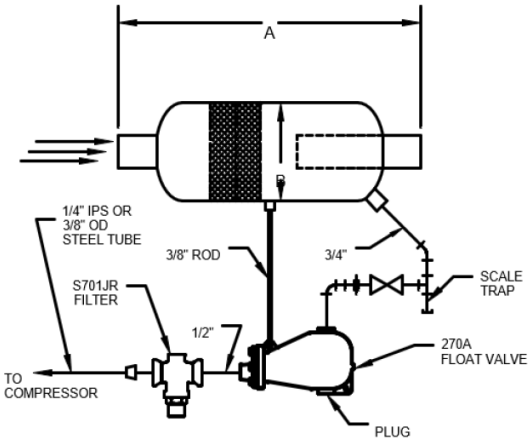
*FLOAT VALVE SUPPORT ROD COUPLING (QTY. 1)
LOCATION (HEAD OR SHELL) DEPENDS ON MODEL

		A	B	U	V	W	Y	Z		
Model No.	Nom Dia.	Length (Pipe-Pipe)	Actual Dia.	Float Valve Support	Inlet (H)	Inlet (V)	Drain	Relief	ODC Inlet and Outlet (Optional)	Est. Shipping Wt. (lbs.)
DOS--2½--¾	2½	16	2.875	¼	¾	¾	¾	N/A	-	10
DOS--5--1¼	5	22	5.563	¼	1¼	1¼	¾	½	1⅜	25
DOS--5--1½	5	22	5.563	¼	1½	1½	¾	½	1⅝	25
DOS--6--1½	6	24	6.625	¼	1½	1½	¾	½	1⅝	33
DOS--6--2	6	24	6.625	¼	2	2	¾	½	2⅛	33
DOS--8--2	8	28.5	8.625	¼	2	2	¾	½	2⅛	44
DOS--8--2½	8	28.5	8.625	¼	2½	2½	¾	½	2⅝	44
DOS--10--2½	10	33	10.75	¼	2½	2½	¾	½	2⅝	75
DOS--10--3	10	33	10.75	¼	3	3	¾	½	3⅛	75
DOS--12--3	12	35	12.75	¼	3	3	¾	½	3⅛	95
DOS--12--4	12	35	12.75	¼	4	4	¾	½	4⅛	95
DOS--16--4	16	41	16	¼	4	4	¾	½	-	148
DOS--20--5	20	52	20	¼	5	5	¾	½	-	328
DOS--24--6	24	59	24	¼	6	6	¾	¾	-	466
DOS--30--8	30	72	30	¼	8	8	¾	¾	-	741

*Multiple nozzle sizes are offered on sizes 5-12 to allow for "in between" selections or when oversized bodies are preferred.
**Piping components available with DOSKIT (minus float valve)

	SWEPT VOLUME DISPLACEMENT, CFM			
	Ammonia		R-22	
Model	Single Stage	Booster Stage	Single Stage	Booster Stage
DOS-2½-¾	18	36	8	12
DOS-3½-1¼	39	78	16	26
DOS-5-1¼	81	162	32	54
DOS-5-1½	81	162	32	54
DOS-6-1½	117	234	47	78
DOS-6-2	117	234	47	78
DOS-8-2	210	420	84	140
DOS-8-2½	210	420	84	140
DOS-10-2½	333	666	133	222
DOS-10-3	333	666	133	222
DOS-12-3	480	960	190	320
DOS-12-4	480	960	190	320
DOS-16-4	750	1500	300	500
DOS-20-5	1175	2350	470	780
DOS-24-6	1715	3430	686	1143
DOS-30-8	3050	6100	1220	2040

*Multiple nozzle sizes are offered on sizes 5-12 to allow for "in between" selections or when oversized bodies are preferred.



Vessel with DOSKIT** and float valve

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Coalescent Oil Separator

The Phillips COS models offer increased filtration capabilities through the dual use of stainless steel wire mesh pads and replaceable coalescing elements.

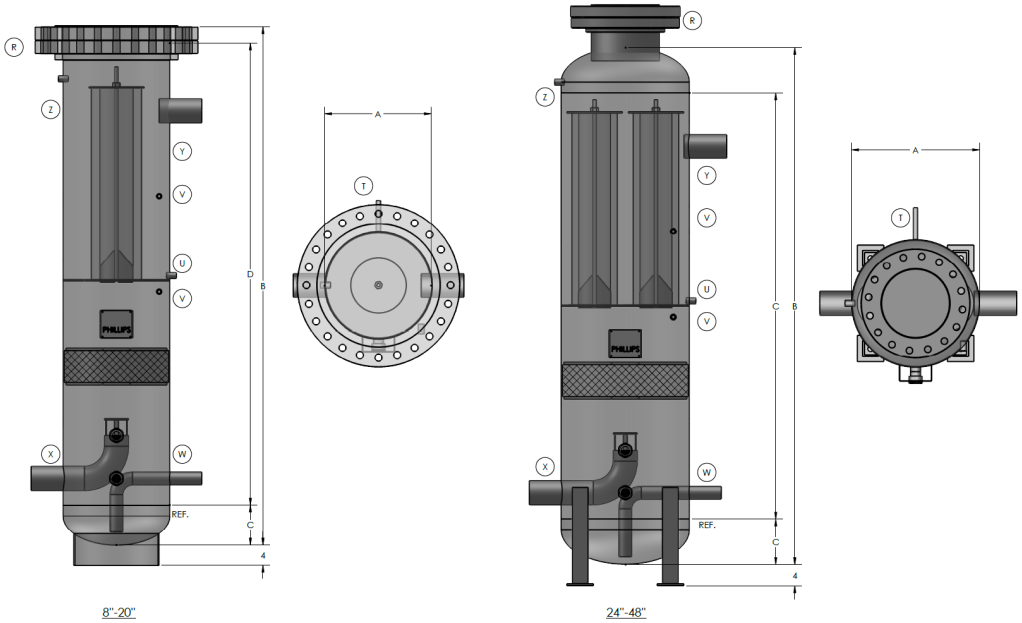
* Design allows for inspection and replacement of coalescing elements.
* For vessels up to 20" diameter, access is through a blind flange. For vessels 24" and larger, access is through a manway.
* Quantity and model of coalescent element is highly dependent on operating conditions. When requesting quote, please provide:
  - Swept Volume (displacement) of compressor
  - Suction Temperature
  - Discharge Pressure

HIGH STAGE COS RATINGS

	SWEPT VOLUME DISPLACEMENT (CFM), +95ºF CONDENSING					
Model	+10ºF	+15ºF	+20ºF	+25ºF	+30ºF	+35ºF
COS10AH	198	178	160	144	131	118
COS12AH	284	255	230	208	188	170
COS16AH	457	411	370	334	302	274
COS20AH	723	650	585	528	477	433
COS24AH	1032	927	835	754	681	618
COS30AH	1632	1466	1320	1191	1077	976
COS36AH	2373	2132	1920	1733	1567	1420
COS42AH	3251	2921	2630	2374	2146	1945
COS48AH	4215	3787	3410	3077	2783	2522

LOW STAGE COS RATINGS

	SWEPT VOLUME DISPLACEMENT (CFM), +10ºF CONDENSING					
Model	-45ºF	-40ºF	-35ºF	-30ºF	-25ºF	-20ºF
COS10AL	211	184	160	140	123	108
COS12AL	304	264	230	201	177	156
COS16AL	489	424	370	324	284	250
COS20AL	772	671	585	512	449	396
COS24AL	1103	958	835	731	642	565
COS30AL	1743	1514	1320	1155	1014	893
COS36AL	2535	2202	1920	1680	1475	1300
COS42AL	3473	3016	2630	2301	2021	1780
COS48AL	4502	3911	3410	2984	2620	2308



8"-20" 24"-48"

COALESCENT OIL SEPARATOR DIMENSIONS

	A	B	C	D		R	T	U	V	W	X	Y	Z	
Model No.	Dia.	OAH	Head	Shell	Level Eye (2)	Flange*	Drain	Drain2	Instrmnt (2)	Oil Outlet	Inlet	Outlet	Relief	Est. Shipping Wt. (lbs.)
COS10AH/AL	10	65	5	60	1100A-R	10	½	½	½	1	2	2	½	440
COS12AH/AL	12	65½	5½	60	1100A-R	12	½	½	½	1½	3	3	½	590
COS16AH/AL	16	78½	6½	72	1100A-R	16	½	½	½	1½	4	4	½	960
COS20AH/AL	20	79½	7½	72	1100A-R	20	½	½	½	2	5	5	¾	1390
COS24AH/AL	24	101	8½	84	1100A-R	12	½	½	½	2	6	6	¾	1200
COS30AH/AL	30	116	10	96	1100A-R	14	½	½	½	2½	8	8	¾	1750
COS36AH/AL	36	119	11½	96	1100A-R	18	½	½	½	3	10	10	¾	2310
COS42AH/AL	42	146	13	120	1100A-R	20	½	½	½	4	10	10	¾	3210
COS48AH/AL	48	149	14½	120	1100A-R	24	½	½	½	5	12	12	¾	3880

All dimensions are in inches
*Flange size subject to change based on coalescing element selection

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Anhydrator System Cleaner

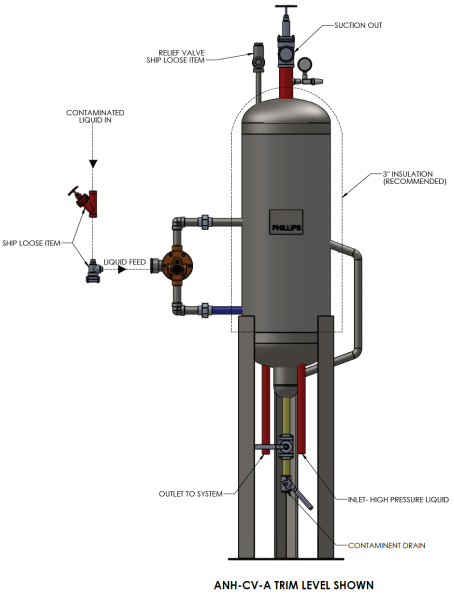
The Anhydrator removes water and other impurities from your ammonia refrigeration system. If left in your system, these impurities can cause inefficient operation, clogging of strainers, corrosion and premature failure of compressor bearings.

If your air purger is venting air, it is leaving behind the moisture that entered the system with the air. Since water is condensable, it is not removed by the purger. Rather, it seeks the lowest temperature location in the system. That's where it can be removed.

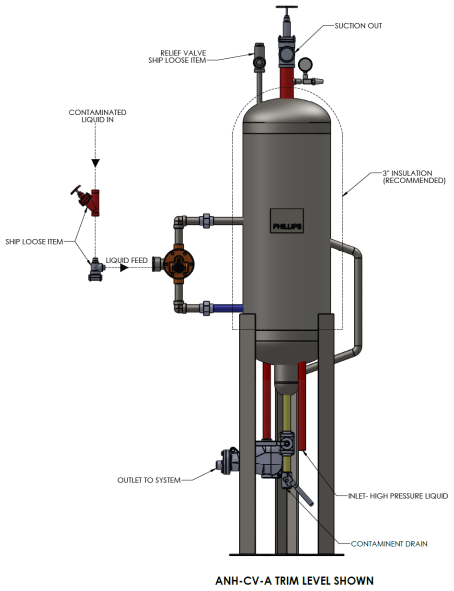
Aside from being a great preventative maintenance tool, the payback can be quite fast. Each percent of water in the ammonia is equal to a 1% drop in compressor efficiency. Put another way, water increases the temperature - pressure relationship of the mixture, causing the compressor to work harder to maintain the same temperature. A clean refrigeration system uses much less energy - that translates into savings.

Trim levels:

- ANH: Bare Anhydrator vessel
- ANH-CV: Anhydrator vessel with valve group shipped loose
- ANH-CV-A: Anhydrator vessel with valve group shipped factory installed (relief, liquid feed stop valve, and strainer ship loose)



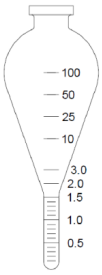
Liquid feed



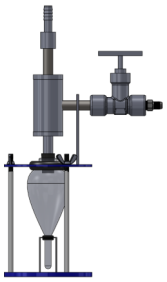
Hot gas feed
(shown with 270A valve - purchased separately)

Valve Group Includes:
Phillips float valve (300HM-GZB)
Liquid in isolation valve
Liquid in strainer
Relief valve
Suction stop valve
Gauge and gauge valve
1" Ball drain valve
Spring return secondary drain

Also available: 100ml lab-grade moisture sampling container, part number ANH-MS
Moisture sampling test stand, part number ANH-AS



- ANH-MS Sampling Container



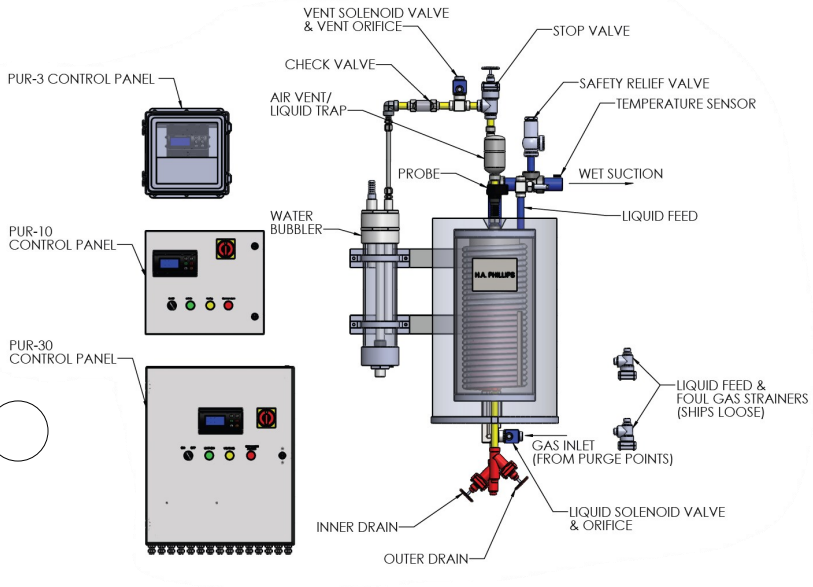
STAND, CHAMBER, NEEDLE VALVE, ANH-MS
INCLUDED IN PLASTIC CASE

- ANH-AS Sampling Stand Kit

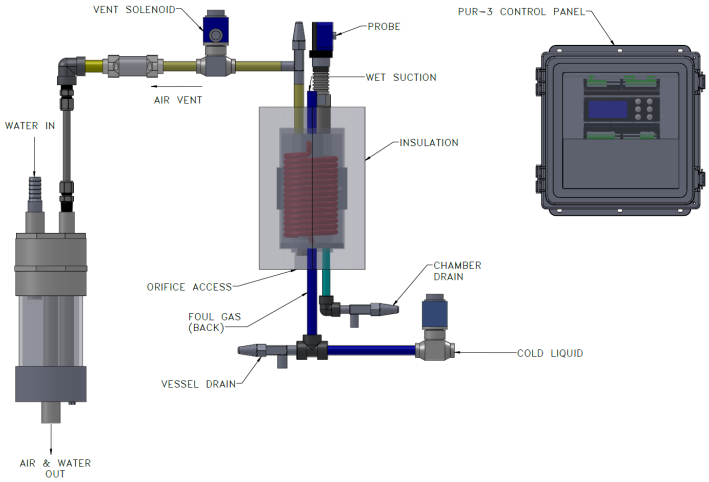
PUR & PURJR Air Purger

The Phillips PUR Air Purger is a simple, robust, high-capacity device that removes non-condensable gases from the refrigerant vapor in a system. The unit operates by condensing foul gas (the mixture of refrigerant vapor and non-condensables) from one or more purge points, metering the purified liquid refrigerant back to the system through a protected suction connection, and venting the non-condensables to atmosphere.

The single size model PUR will effectively purge non-condensables from any sized refrigeration system and works with all typical refrigerants.
The smaller PURJR is designed to operate single condenser systems.



PUR Air Purger



PURJR

The PUR Air Purger ships bracket mounted and insulated with the following available options:

- Bubbler
- 3, 10, or 30-point control panel

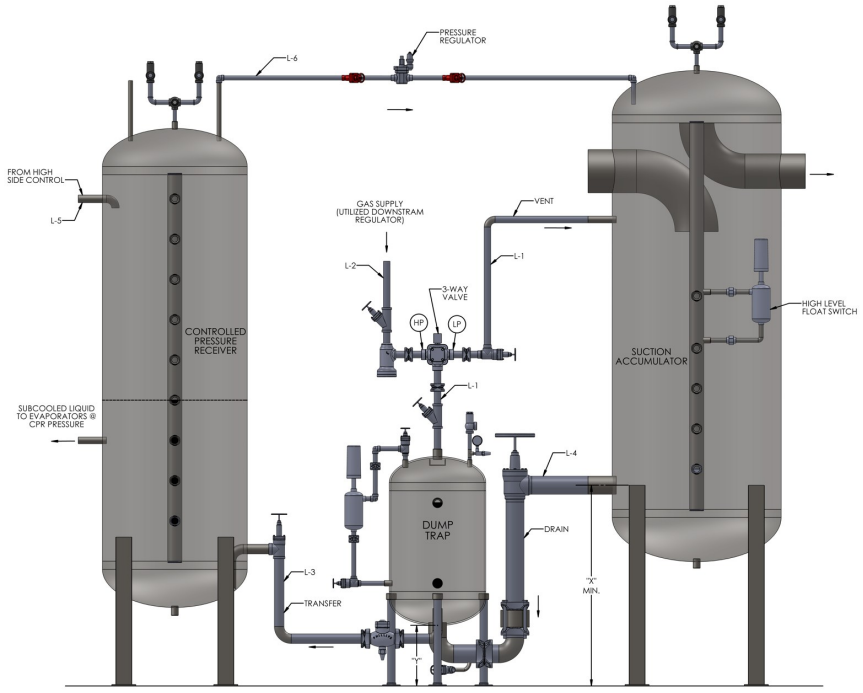
The PURJR Air Purger ships with factory insulation, bubbler, and 3-point controller included.

When ordering, please specify desired trim level:

- PUR-I: Purger with valves and Insulation
- PUR-BI: Purger with valves, bubbler and insulation
- PUR-IP: Purger with valves, insulation and 3-point control panel
- PUR-BIP: Purger with valves. bubbler, insulation, and 3-point control panel
- Purge point expansion module ordered at time of purchase depending on system requirements

Gas Driven Recirculating Systems

Phillips Type DR Gas Driven Recirculating systems overfeed evaporators with partially subcooled liquid without the use of mechanical pumps, while also providing slop-over protection for the compressors. Furthermore, with a properly designed CPR vessel, DR systems can also be used in both stages of a 2-stage system, or can also be used to circulate totally subcooled liquid.



Typical GDRS System Layout
(Vertical Dump Trap shown)

VERTICAL DUMP TRAP SYSTEMS-AMMONIA

LIQUID RETURN UNIT CAT. NO.	TOTAL TONS AT ACCUMU-LATOR	LIQUID RETURN CAPACITY (GPM)	DUMP TRAP SIZE (D. X HT.) (IN.)	MIN. DRAIN HEIGHT 'X' REQ'D (IN.)	DIM. 'Y' (IN.)	LINE SIZES (IPS-IN.)				SHIPPING WEIGHT (LBS.)
						L-1 (TRAP) (VENT)	L-2 (GAS) SUPPLY	L-3 (TRANSFER)	L-4 DRAIN (TO TRAP)	
DR40V	40	7	12 X 26	30	10	¾	¾	¾	1½	275
DR75V	75	14	16 X 38	40	11	¾	¾	1¼	2	400
DR100V	100	18	18 X 38	44	12	1¼	1¼	1¼	2½	585
DR150V	150	28	20 X 40	46	13	1¼	1¼	1½	3	630
DR260V	260	48	24 X 42	47	16	1¼	1¼	2	4	780
DR520V	520	98	30 X 54	66	18	2	1¼	3	4 (2)	1630
DR920V	920	190	42 X 60	78	24	3	1½	3	4 (3)	1875

HORIZONTAL DUMP TRAP SYSTEMS-AMMONIA

LIQUID RETURN UNIT CAT. NO.	TOTAL TONS AT ACCUMU-LATOR	LIQUID RETURN CAPACITY (GPM)	DUMP TRAP SIZE (D. X HT.) (IN.)	MIN. DRAIN HEIGHT 'X' REQ'D (IN.)	DIM. 'Y' (IN.)	LINE SIZES (IPS-IN.)				SHIPPING WEIGHT (LBS.)
						L-1 (TRAP) (VENT)	L-2 (GAS) SUPPLY	L-3 (TRANSFER)	L-4 DRAIN (TO TRAP)	
DR40H	40	7	12 X 26	25	10	¾	¾	¾	1½	275
DR75H	75	14	16 X 38	30	11	¾	¾	1¼	2	400
DR100H	100	18	18 X 38	27	12	1¼	1¼	1¼	2½	585
DR150H	150	28	20 X 40	35	13	1¼	1¼	1½	3	630
DR260H	260	48	24 X 42	42	16	1¼	1¼	2	4	780
DR520H	520	98	24 X 84	42	16	2	1¼	3	4 (2)	1830
DR920H	920	190	30 X 115	45	18	3	1½	4	4 (3)	2110

Gas Driven Recirculating Systems

ITEMS SUPPLIED WITH STANDARD DR SYSTEMS:

Dump Trap: Pressure vessel rated for -50°F and 300 PSI, "U" stamped and National Board registered

3-Way Valve: Phillips Series 3000 solenoid-operated 3-way valve, with angle filter (other valve arrangements available for very large systems)

Level Control: External float switch (initiates transfer cycle)

Accessories: Level Eyes®, gauge and gauge valve, relief valve, unions, floor flanges (vertical traps)

Control Panel: UL/NEMA4 enclosure with adjustable timer, manual transfer switch, mounted cycle counter, alarm selector switch and pilot light indicators.

LINE L-1: Stop valves and unions

LINE L-2: Stop valves, downstream regulator, filter/strainer and union

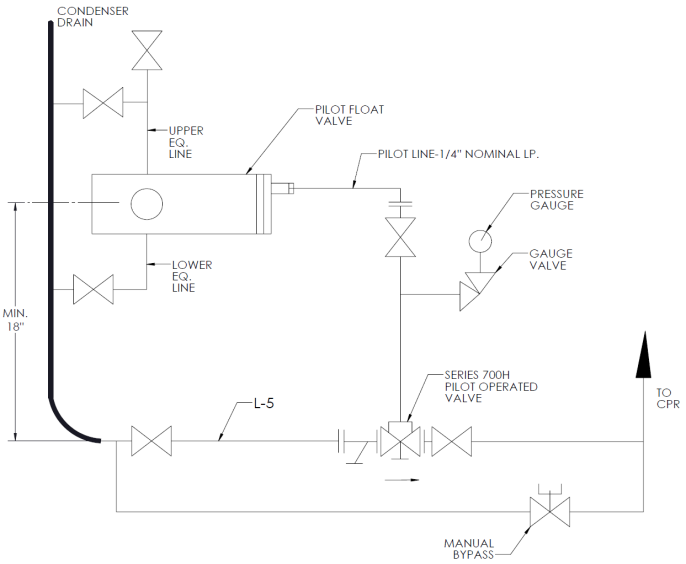
LINE L-3: Stop valve, outlet check valve

LINE L-4: Stop valve, inlet check valve, union, drain valve

OPTIONAL RC HIGH SIDE CONTROL (WITH OR WITHOUT PILOT RECEIVER)

PLANT SIZE (TONS)	L-5 SIZE (IN.)	L-6 SIZE (IN.)	WITHOUT PILOT RCVR		WITH PILOT RCVR		
			MODEL	SHIPPING WT (LBS)	MODEL	PILOT RCVR MODEL*	SHIPPING WT (LBS)
80	¾	¾	RC075	130	RC075PR	PRV-1248B	280
160	1	¾	RC100	145	RC100PR	PRV-1248C	295
250	1-¼	¾	RC125	190	RC125PR	PRV-1248D	340
400	1-½	¾	RC150	240	RC150PR	PRV-1248E	390
800	2	1-¼	RC200	310	RC200PR	PRV-1248F	460
1250	2-½	1-½	RC250	490	RC250PR	PRV-1648A	730
2000	3	2	RC300	560	RC300PR	PRV-1648B	800
3000	4	2-½	RC400	740	RC400PR	PRV-2060A	1280

* Refer to page 8 for further description of Pilot Receiver



Typical High Side Control Schematic

ITEMS SUPPLIED WITH RC HIGH SIDE CONTROL SYSTEMS:

- Series 275AP pilot float valve and steel float chamber with Level Eye® sight glass
- (2) ¾" Service valves for pilot float valve chamber
- ¾" vent valve for pilot float valve chamber
- Pilot line kit including gauge valve, gauge, 1/4" service valve, union and ½" x ¼" bushing
- **LINE L-5:** Series 700H high side pilot-operated main valve with strainer, (2) isolation valves and hand expansion bypass valve
- **Line L-6:** Pressure regulator with (2) isolation valves (purchased separately)

Compressor Protection Systems

Phillips compressor protection systems economically transfer accumulated liquid from the low side of the system to the high side where the liquid can be re-used without unnecessary phase changes.

SYSTEM TYPES AND DESCRIPTIONS

Type T: For transferring liquid to a CPR or other intermediate pressure vessel. This system requires the target vessel to be at least 10PSI lower than compressor discharge pressure. A regulator should be used upstream of the 3-way valve to control inlet pressure just high enough to make the transfer.
Type A: For transferring liquid to a HPR when the suction accumulator is at a higher elevation than the HPR.
Type DK: For transferring liquid to a HPR with the assistance of an interrupting valve that maintains a pressure difference between the dump trap and the HPR.
Type G: For transferring liquid to a HPR with the assistance of a mechanical pump.

SYSTEM COMPONENTS

Dump Trap: Pressure vessel rated for -50ºF and 300 PSI, stamped and National Board registered
3-Way Valve: Phillips Series 3000 solenoid-operated 3-way valve, with angle filter (other valve arrangements available for very large systems)
Check Valves: Phillips Series 600 and 700 flanged in-line disc and piston type check valves as indicated in piping schematics
Service Valves: Hand stop valves as indicated in system piping schematics
Level Control: External float switch (initiates transfer cycle)
Accessories: Level Eyes®, gauge and gauge valve, relief valve, unions, floor flanges (vertical traps)
Control Panel: UL/NEMA4 enclosure with adjustable timer(s), manual transfer switch, mounted cycle counter, alarm selector switch and pilot light indicators.

ADDITIONAL ITEMS FOR TYPE G SYSTEMS:

Pump: Nikkiso or Teikoku sealless liquid refrigerant pump is standard. Corken centrifugal and magnetic drive pumps available as options.
Pump Relief: A check valve is placed in the bypass line going back to the pump suction to prevent deadheading

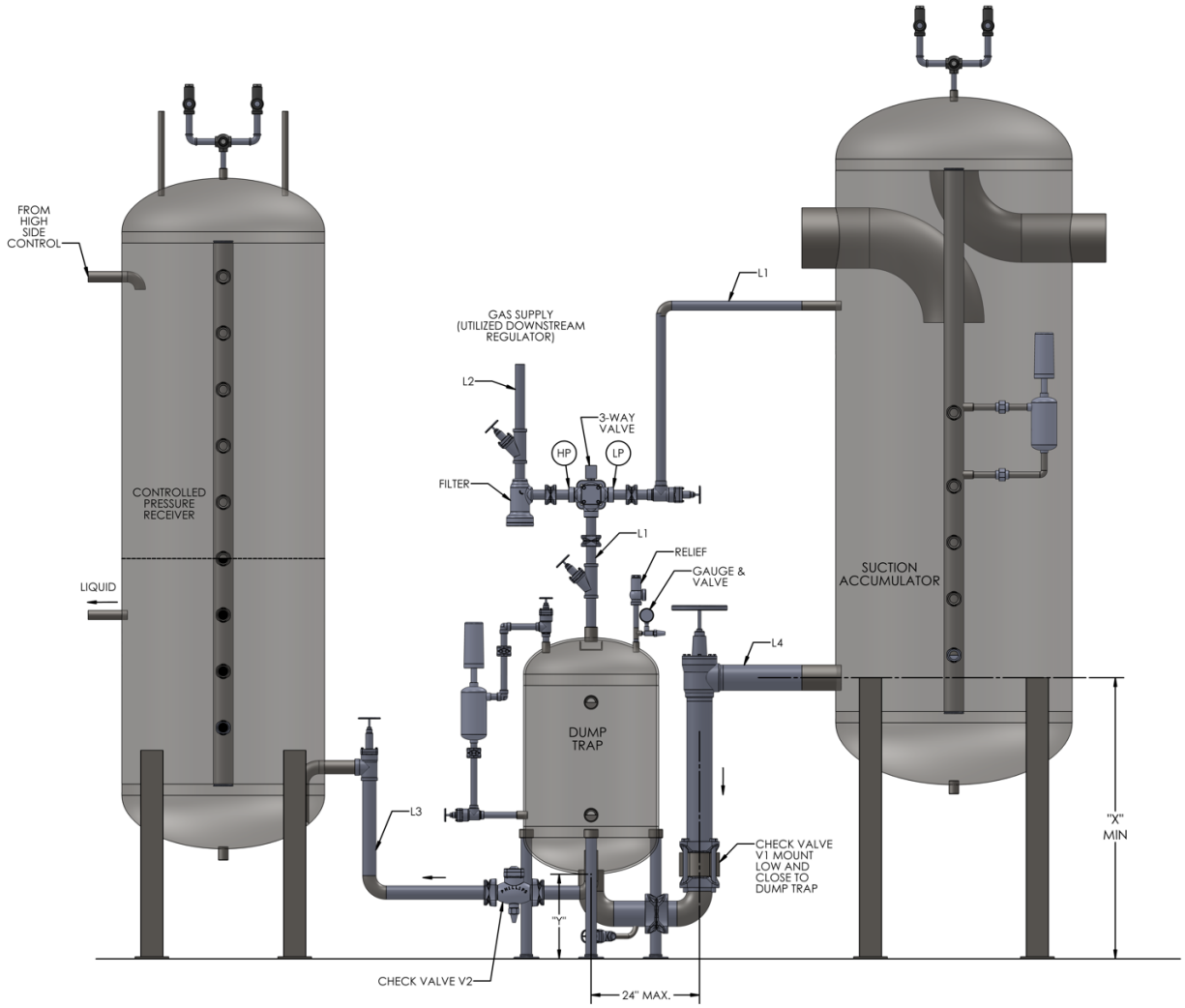
SEQUENCE OF OPERATIONS

For all types of transfer system, the transfer cycle is initiated when the liquid draining from the suction accumulator reaches the middle of the upper Level Eye on the dump trap. This signal energizes the 3-way valve changing its operation from vent to hot gas supply. Liquid is then transferred according to system type:
TYPE T: As liquid starts to transfer, the level in the trap drops causing the float switch to open. This starts the adjustable off-delay cycle timer. When the cycle times out, the 3-way valve de-energizes and allows the trap to vent back to the accumulator. The timer should be set so that all liquid is drained past the outlet check valve.
TYPE A: As liquid starts to transfer, the level in the trap drops causing the float switch to open. This starts the adjustable off-delay cycle timer. When the cycle times out, the 3-way valve de-energizes and allows the trap to vent back to the accumulator. The timer should be set so that all liquid is drained past the hand valve at the HPR.
TYPE DK: When the 3-way valve is energized so is the interrupting valve, causing it to change from wide open to differential pressure control. Since the pressure in the hot gas line to the trap is higher than the HPR pressure, the liquid will start to flow out of the trap, causing the float switch to open. This starts the adjustable off-delay cycle timer. When the cycle times out, the 3-way valve de-energizes, allowing the trap to vent back to the accumulator and the interrupting valve is de-energized. The timer should be set to drain the liquid completely past the outlet check valve.
TYPE G: The float switch actuation also starts 2 adjustable on-delay relays, one for the pump and one for pump protection. When the pump on-delay timer times out, the pump starts and the transfer begins. As liquid starts to transfer, the level in the trap drops causing the float switch to open. This starts the adjustable off-delay cycle timer. When the cycle timer times out, the pump stops and the 3-way valve is de-energized, allowing the trap to vent back to the accumulator. The pump on-delay timer must be set to allow time for the trap to become fully pressurized before the pump starts. The off-delay timer should be set to time out when the liquid level reaches the lower Level Eye (take care to never let the pump run dry). The pump protection on-delay timer should be set 10-15 seconds longer than the complete cycle and is meant to stop the pump if the float switch ever sticks open.

INSTALLATION HINTS

- ALWAYS mount the inlet check valve as low and close to the dump trap as possible.
- On Type A systems, mount the outlet check valve vertically as close to the HPR as possible.
- Disc type checks should be mounted in the vertical orientation unless it is absolutely necessary to mount horizontally.
- Piston type checks can be mounted in either orientation but horizontal is preferred. It should be mounted below the lower Level Eye® on the trap.
- Mount float switch to engage at upper Level Eye®
- Insulate the dump trap; do not insulate the check valves
- Take care to set the timers properly. Adjust the timers as necessary whenever the refrigeration system operating parameters change.

Type T - Compressor Protection System



CATALOG NUMBER*	ACCUM. CAP (TONS)	SYSTEM CAPACITY (GPM)	DUMP TRAP DIA x LNG (IN.)	"X" (MIN REQ'D, IN.)		"Y" (REF.) (IN.)	IPS LINE SIZES				SHIPPING WEIGHT (LBS.)
				VERT.	HOR.		L1 VENT	L2 GAS	L3 TRANSFER	L4 DRAIN	
T187V/H**	140	3.7	12 x 26	30	25	10	¾	¾	¾	1¼	270
T287V/H	240	6.1	12 x 26	30	25	10	¾	¾	¾	1½	285
T387V/H	440	10.9	16 x 38	40	30	11	¾	¾	1¼	2	430
T487V/H	760	19.1	20 x 40	46	35	13	1¼	1¼	1¼	3	670
T587V/H	1480	31.2	24 x 42	47	42	16	1¼	1¼	2	4	810
T687H	2000	56.5	24 x 72	SP.	42	16	1¼	1¼	3	4	1180
T787H	3000	73.4	24 x 84	SP.	42	16	2	1¼	3	4 (2)	1630

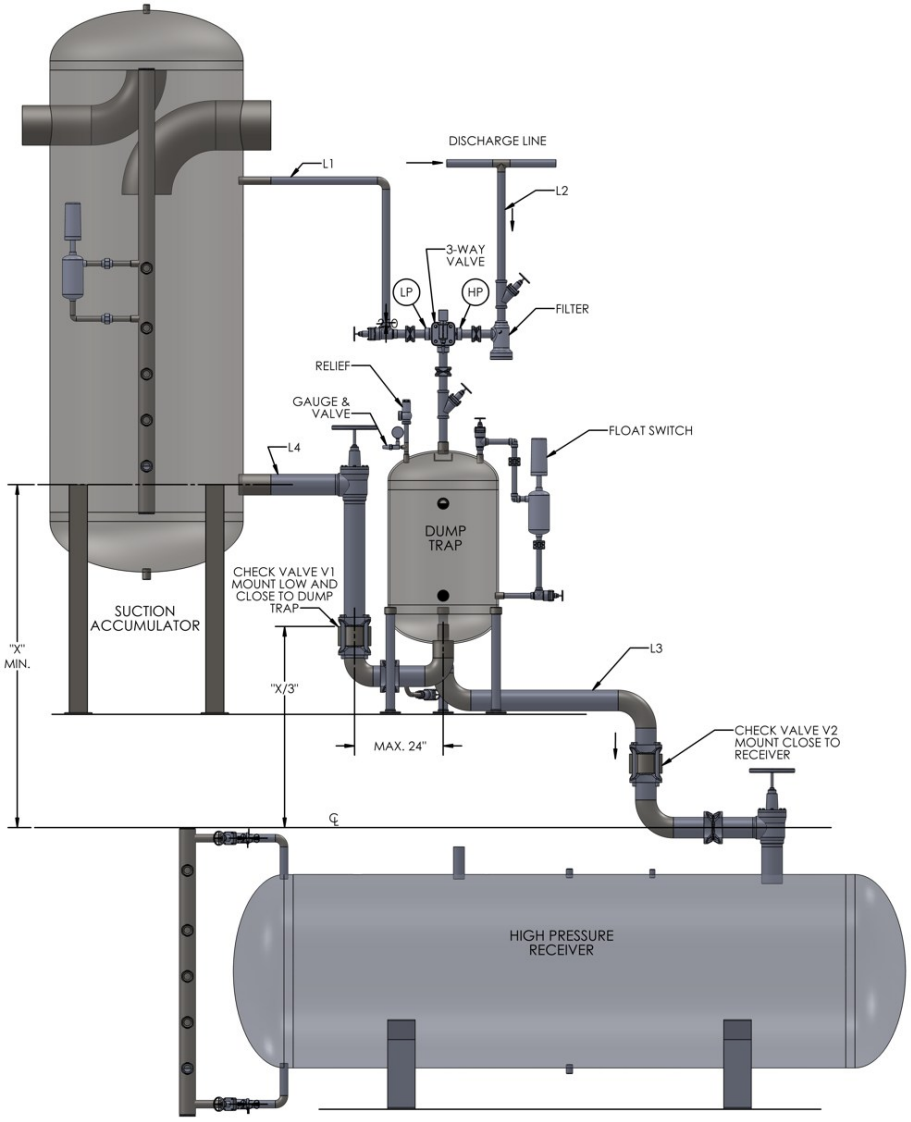
Ordering Instructions:

* When ordering, specify suffix "V" (for vertical dump trap) or suffix "H" (for horizontal dump trap).

** Do not use 187 size systems when accumulator suction temperature is below 0°F. Upsize to 287 system.

If system is to be used for Halocarbon refrigerant, use 1/4 of the tonnage ratings shown for R-717.
Add an "F" in front of the Catalog Number. Seal cap valves and accessories will be furnished.

Type A - Compressor Protection System

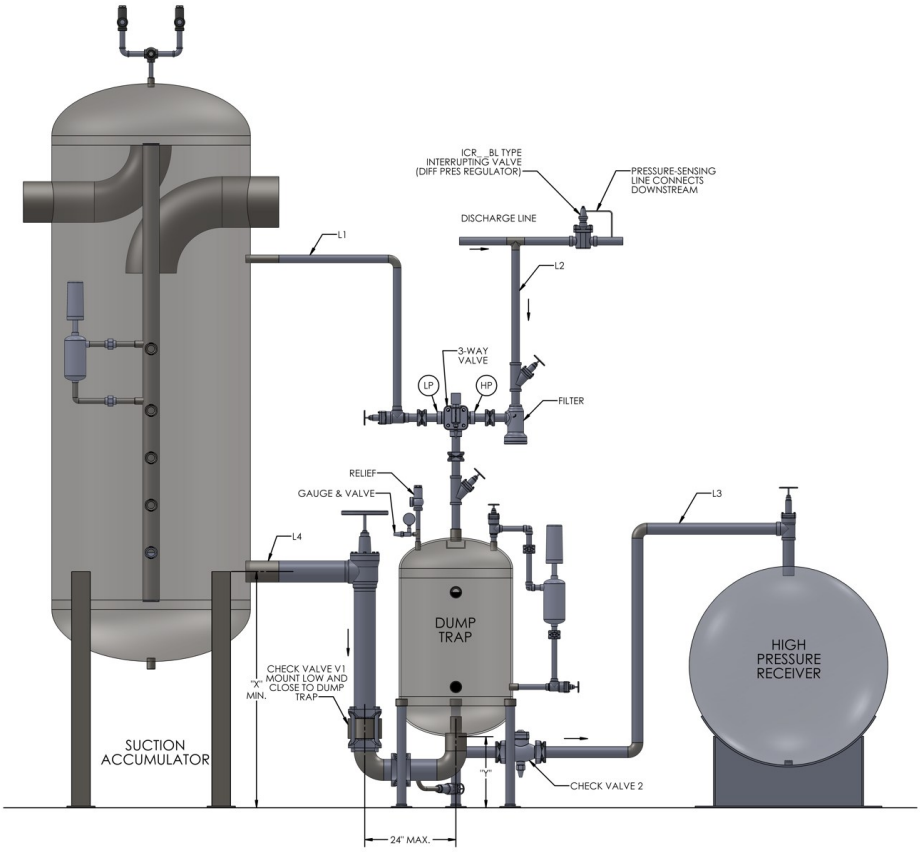


CATALOG NUMBER*	ACCUM. CAP (TONS)	SYSTEM CAPACITY (GPM)	DUMP TRAP DIA x LNG (IN.)	"X" (MIN REQ'D) (IN.)		IPS LINE SIZES				SHIPPING WEIGHT (LBS.)
				VERT.	HOR.	L1 VENT	L2 GAS SUPPLY	L3 TRANSFER	L4 DRAIN	
A187V/H**	100	2.7	12 x 26	38	28	¾	¾	1¼	1¼	270
A287V/H	200	6.7	12 x 26	40	30	¾	¾	1½	1½	285
A387V/H	300	7.5	16 x 38	55	36	¾	¾	2	2	450
A487V/H	800	20.2	20 x 40	62	45	1¼	1¼	3	3	700
A587V/H	1320	33.3	24 x 42	70	55	1¼	1¼	4	4	850

Ordering Instructions:
* When ordering, specify suffix "V" (for vertical dump trap) or suffix "H" (for horizontal dump trap).
** Do not use 187 size systems when accumulator suction temperature is below 0°F. Upsize to 287 system.

If system is to be used for Halocarbon refrigerant, use 1/4 of the tonnage ratings shown for R-717.
Add an "F" in front of the Catalog Number. Seal cap valves and accessories will be furnished.

Type DK - Compressor Protection System



CATALOG NUMBER*	ACCUM. CAP (TONS)	SYSTEM CAPACITY (GPM)	DUMP TRAP DIA x LNG (IN.)	"X" (MIN REQ'D, IN.)		"Y" (REF.) (IN.)	IPS LINE SIZES				SHIPPING WEIGHT (LBS.)
				VERT.	HOR.		L1 VENT	L2 GAS	L3 TRANSFER	L4 DRAIN	
DK187V/H**	120	3	12 x 26	30	25	10	¾	¾	¾	1¼	270
DK287V/H	200	5.1	12 x 26	30	25	10	¾	¾	¾	1½	285
DK387V/H	360	9.1	16 x 38	40	30	11	¾	¾	1¼	2	430
DK487V/H	560	14.2	20 x 40	46	35	13	1¼	1¼	1¼	3	670
DK587V/H	1160	29.2	24 x 42	47	42	16	1¼	1¼	2	4	810

Ordering Instructions:
Order “DK” System based on accumulator tonnage.
* When ordering, specify suffix "V" (for vertical dump trap) or suffix "H" (for horizontal dump trap).
** Do not use 187 size systems when accumulator suction temperature is below 0°F. Upsize to 287 system.

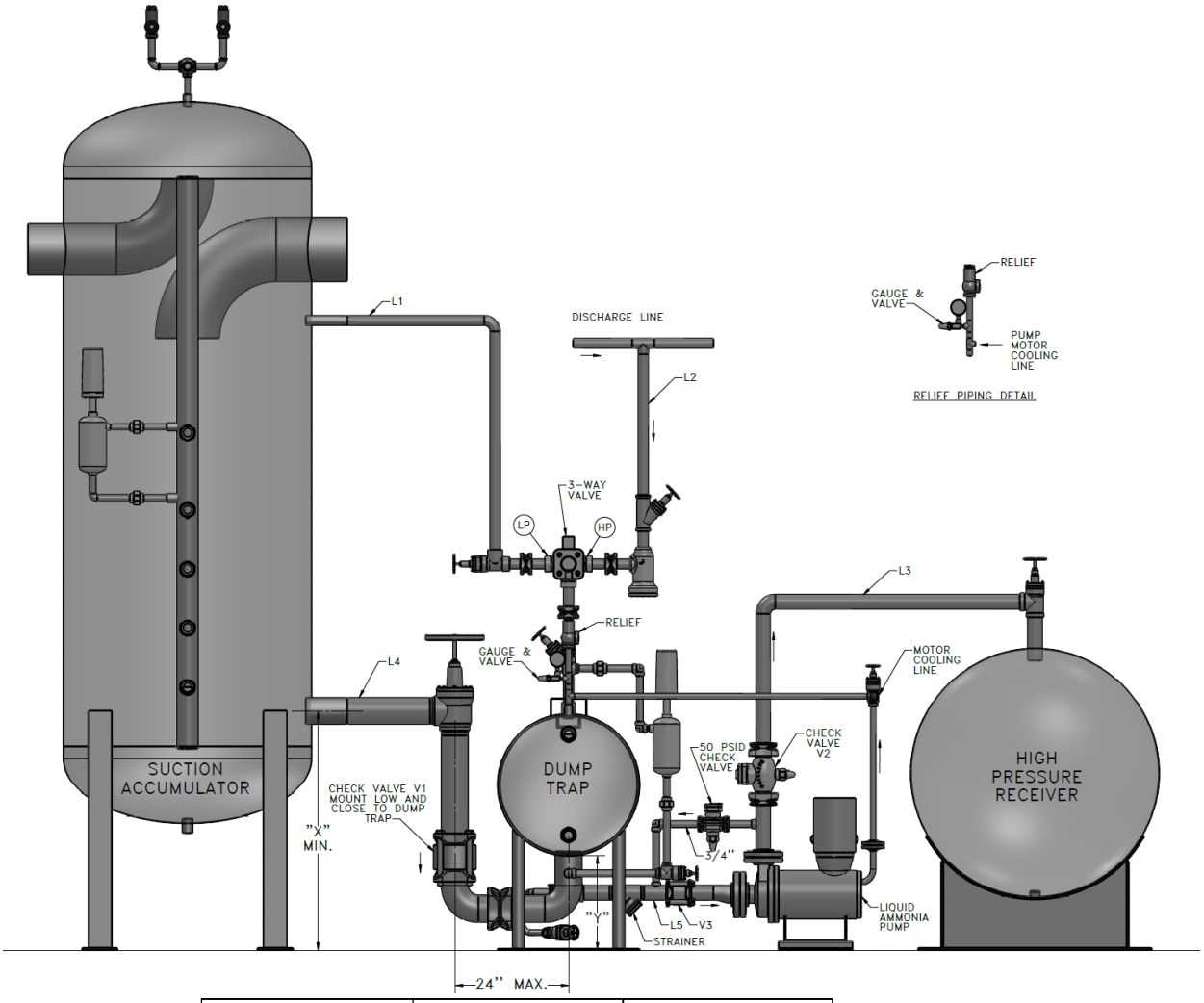
If system is to be used for Halocarbon refrigerant, use 1/4 of the tonnage ratings shown for R-717.
Add an "F" in front of the Catalog Number. Seal cap valves and accessories will be furnished.

INTERRUPTING VALVES FOR DK SYSTEMS			
VALVE CATALOG NUMBER	PLANT TONS (R717)	PIPE SIZE (IPS)	SHIPPING WEIGHT (LBS.)
ICR40BL	80	1½ ; 2	40
ICR50BL	140	2	55
ICR65BL	320	3	175
ICR80BL	640	4	265
ICR100BL	1160	5	380
ICR125BL	1800	6	400

*Interrupting valve sold separately

Ordering Instructions:
Order interrupting valve based on tonnage of the discharge line to be used for its installation.
Never use an interrupting valve that is more than one pipe size smaller than the usable discharge line.

Type G - Compressor Protection System



CATALOG NUMBER*	ACCUM. CAP (TONS)	SYSTEM CAPACITY (GPM)	DUMP TRAP DIA x LNG (IN.)	NIKKISO "X" (MIN REQ'D) (IN.) VERT.	NIKKISO "X" (MIN REQ'D) (IN.) HOR.	NIKKISO "Y" (REF.) (IN.)	NIKKISO PUMP MOTOR (HP)	TEIKOKU "X" (MIN REQ'D) (IN.) VERT.	TEIKOKU "X" (MIN REQ'D) (IN.) HOR.	TEIKOKU "Y" (REF.) (IN.)	TEIKOKU PUMP MOTOR (HP)	CORKEN "X" (MIN REQ'D) (IN.) VERT.	CORKEN "X" (MIN REQ'D) (IN.) HOR.	CORKEN "Y" (REF.) (IN.)	CORKEN PUMP MOTOR (HP)	IPS LINE SIZES L1 VENT	IPS LINE SIZES L2 GAS SUPPLY	IPS LINE SIZES L3 TRANSFER	IPS LINE SIZES L4 DRAIN	IPS LINE SIZES L5 PUMP SUCTION	SHIPPING WEIGHT (LBS.)
G187V/H**	120	3	12 x 26	33	28	13*	2.17	32	27	12*	1.7	30	25	10	¾	¾	¾	1	1¼	1¼	515
G287V/H	170	4.3	12 x 26	33	28	13*	2.17	32	27	12*	1.7	30	25	10	¾	¾	¾	1	1½	1¼	535
G387V/H	360	9	16 x 38	42	32	13*	2.17	42	32	13*	1.7	40	30	11	2	¾	¾	1¼	2	1½	750
G487V/H	560	14	20 x 40	46	35	13	2.17	46	35	13	1.7	46	35	13	2	1¼	1¼	1¼	3	1½	1060
G587V/H	1040	26	24 x 42	47	42	16	3.21	47	42	16	1.7	47	42	16	3	1¼	1¼	2	4	2	1695
G687H	1200	30	24 x 72	SP.	42	16	3.21	SP.	42	16	1.7	SP.	42	16	3	1¼	1¼	3	4	3	2000
G787H	2000	50	24 x 84	SP.	42	16	3.21	SP.	42	16	5.2	SP.	42	16	5	2	1¼	3	4 (2)	3	2600

Ordering Instructions:
* When ordering, specify suffix "V" (for vertical dump trap) or suffix "H" (for horizontal dump trap).
** Do not use 187 size systems when accumulator suction temperature is below 0°F. Upsize to 287 system.

If system is to be used for Halocarbon refrigerant, use 1/4 of the tonnage ratings shown for R-717.
Add an "F" in front of the Catalog Number. Seal cap valves and accessories will be furnished.

The standard wired control panel is 120V control; motors are 460/3/60 voltage

The standard Teikoku or Nikkiso pump furnished with the systems above is a sealless hermetic pump, and operates to a minimum of –50°F. Corken pumps are mechanically sealed and operate to a minimum temperature of –20°F.
Optional pumps, including magnetic drive pumps, may require changes to piping schematic.

Packaged Mechanical Pump Recirculators

Pump Recirclator Packages

Each Phillips mechanical Pump recirculating system is custom-designed and trimmed out to customer's specification

Standard Features:

- 250# ASME Reciculator Vessel, National Board Listed, custom designed to meet liquid-vapor separation and surge requirements
- 300# ASME Oil Pot, fully trimmed and piped
- Valved and flanged level column with Phillips Level Eye® sight glasses, mounted high level float switch and drain valve
- Customer's choice of pump manufacturer/type, selected for "standard" 30 psid and 3:1 recirculation
  - * Nikkiso Sealless
  - * Teikoku Sealless
  - * Cornell HT Hermetic
- Dual relief assembly for main reciculator vessel, single relief valve for oil pot
- Piping complete with pump suction service valves, discharge stop and check valves, bypass hand expansion valves, pump relief and motor cooling recirculation valves.
- Welded structural steel base
- Check valves are H.A. Phillips
- 1 coat primer and 4-6 mils of engineered epoxy top coat

Common Optional Equipment:

Level Control:

- Multiple float switches for low level, operating level and upper level
- Level probe
- Electric controller to interpret probe signal

Liquid Makeup:

- Conventional solenoid valve with strainer and expansion valve with expansion valve bypass loop
- Motorized valve with solenoid for power failure protection, with expansion bypass loop
- Danfoss ICF packaged valve station

NEMA4 Control Panel:

- Modbus RS485 Serial Communication
- Door mounted controller and LED liquid level indicator
- Liquid level and cavitation control capabilities
- Includes main disconnect and pump starters, factory mounted and wired
- Optional alarm horn and silence (ships loose)

Other Available Options:

- Post Weld Heat Treatment
- Vessel Pressure ratings other than 250 psig
- Oil Pot heater: 1.5kW or 2kW with integral thermostat
- Pump requirements other than 30 psid or 3:1 recirculation
- Valve packages using manufacturers other than Danfoss or Phillips
- Low temperature piping components when necessary
  *Will use ASME B31.5 low temp pipe exemption when allowed
- Factory wiring
- Sandblasting (SSPC-SP 6)
- Special paint

PUMP CAPACITY REQUIREMENTS
NH3 FLOW GPM PER TON

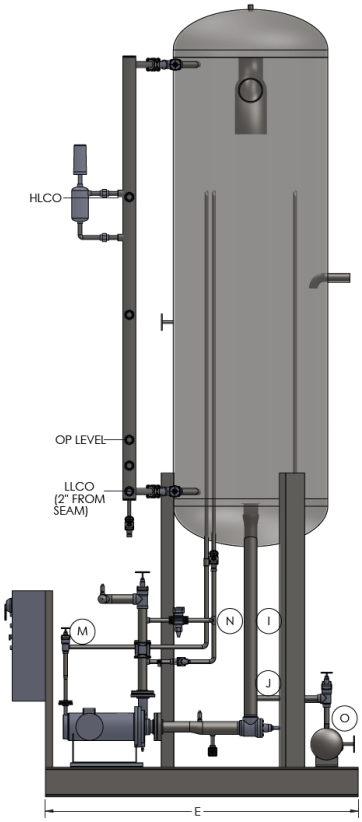
OVERFEED RATE	EVAPORATOR TEMPERATURE (°F)								
	30°	20°	10°	0°	-10°	-20°	-30°	-40°	-50°
3 : 1	.206	.201	.196	.191	.186	.182	.178	.174	.171
4 : 1	.275	.268	.261	.254	.249	.243	.238	.232	.228
6 : 1	.412	.401	.391	.382	.373	.364	.356	.349	.342

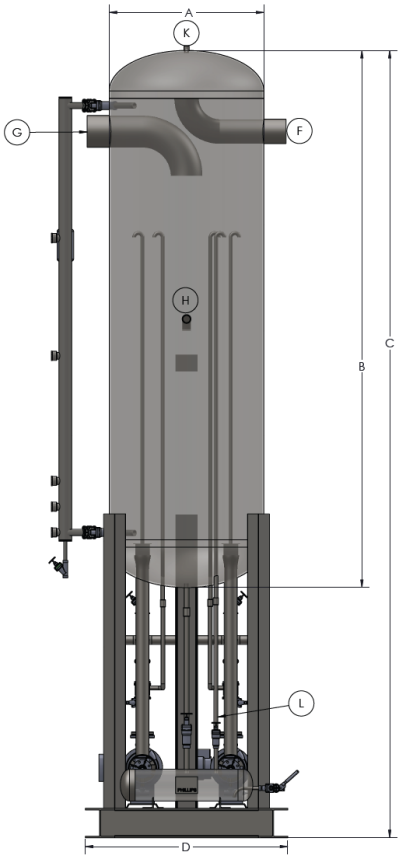
Packaged Mechanical Pump Recirculators

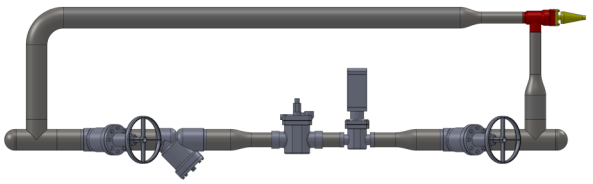
	EVAPORATOR TEMPERATURE, ºF										Surge Volume	Estimated Ship Wt
	SINGLE STAGE*						TWO STAGE**					
	30	20	10	0	-10	-20	-20	-30	-40	-50		
PVR24	172	155	138	123	109	96	114	100	87	75	14.0	2700
PVR30	272	245	219	195	173	152	181	158	138	119	20.7	3000
PVR36	396	356	319	284	251	221	263	230	200	173	30.0	3400
PVR42	543	488	437	389	344	303	360	316	274	237	55.0	4000
PVR48	712	640	573	510	452	398	473	414	360	311	69.2	4400
PVR54	896	806	721	642	569	501	595	521	453	391	83.2	5600
PVR60	1110	999	894	796	705	621	738	646	562	485	98.4	7100
PVR72	1597	1436	1286	1145	1014	893	1061	929	808	697	121	9200
PVR84	2172	1953	1748	1557	1379	1214	1443	1264	1099	949	147	13700
PVR96	2850	2563	2294	2043	1810	1593	1894	1659	1442	1245	220	15800
PVR108	3602	3240	2900	2583	2288	2014	2394	2097	1823	1574	278	19800
PVR120	4443	3996	3571	3186	2822	2484	2953	2586	2249	1941	292	24800
PVR144	6389	5747	5144	4582	4058	3572	4247	3719	3234	2791	422	36600

* Single stage capacities based on 96ºF liquid supply

** Two stage capacities based on +20ºF liquid supply







Valve Trains

* Solenoid, motorized valve, or pulse-width modulated control

* Danfoss, Hansen, or Parker valves available

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O			
Model Number	OD	OAH	Pkg Ht	Base Width	Base Length	Wet Suction	Dry Suction	Liq. Feed	Pump Suction	Oil Pot Drain†	Relief	Oil Pot Vent	Pump Vent/ Cooling	Bypass	Oil Pot	LLCO*	OP Level*	HLCO*
PVR24	24	113	179	42	75	6	5	1¼	4	1	¾	¾	¾	¾	8 x 36	2	16	73
PVR30	30	116	182	55	75	8	6	1½	4	1	¾	¾	¾	¾	8 x 36	2	16	69
PVR36	36	119	185	65	84	8	6	2	4	1	¾	¾	¾	¾	8 x 36	2	16	69
PVR42	42	146	214	55	85	10	8	2½	4	1	¾	¾	¾	¾	8 x 36	2	16	87
PVR48	48	149	215	62	90	10	10	2½	4	1	¾	¾	¾	¾	8 x 36	2	16	84
PVR54	54	152	221	68	96	12	10	3	5	1	¾	¾	¾	¾	8 x 36	2	16	81
PVR60	60	155	223	72	96	12	12	3	5	1¼	¾	¾	¾	1	10 x 36	2	16	78
PVR72	72	161	227	78	112	16	14	4	6	1¼	¾	¾	¾	1	10 x 36	2	16	69
PVR84	84	167	233	98	124	18	16	5	8	1½	¾	1	¾	1¼	12 x 36	2	16	63
PVR96	96	173	239	102	128	20	18	5	8	1½	¾	1	¾	1¼	12 x 36	2	16	70
PVR108	108	179	245	114	132	20	20	6	10	1½	1	1	¾	1¼	12 x 36	2	16	70
PVR120	120	185	251	126	132	24	24	6	10	1½	1	1	¾	1½	12 x 36	2	16	62
PVR144	144	197	263	150	156	24	24	8	12	1½	1¼	1	¾	1½	12 x 36	2	16	62

* Dimensions are taken from lower head/shell seam.

†For temperatures below -20° oil drain size is 1-1/2"

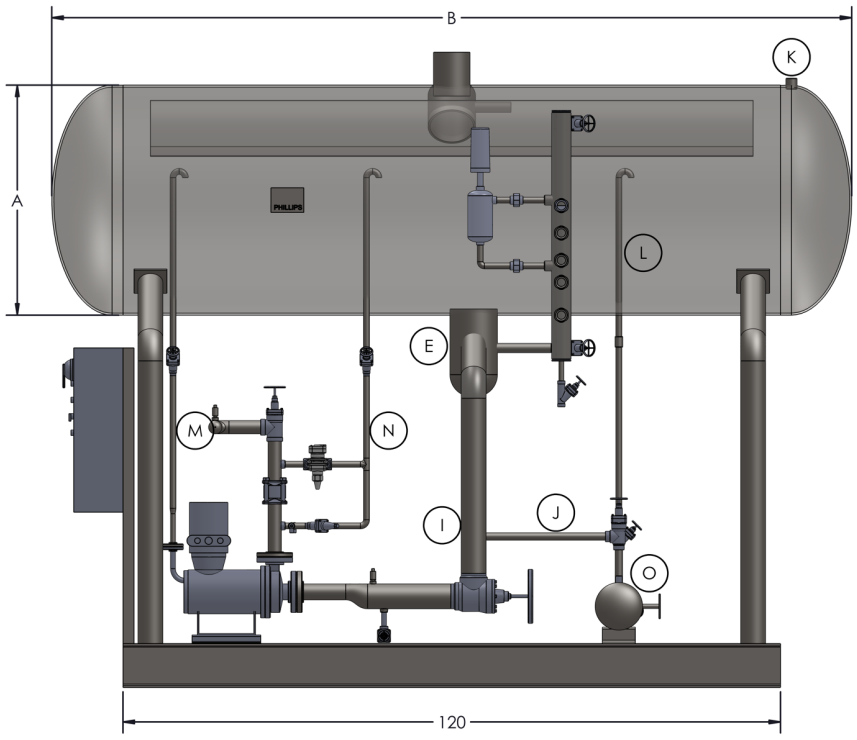
All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

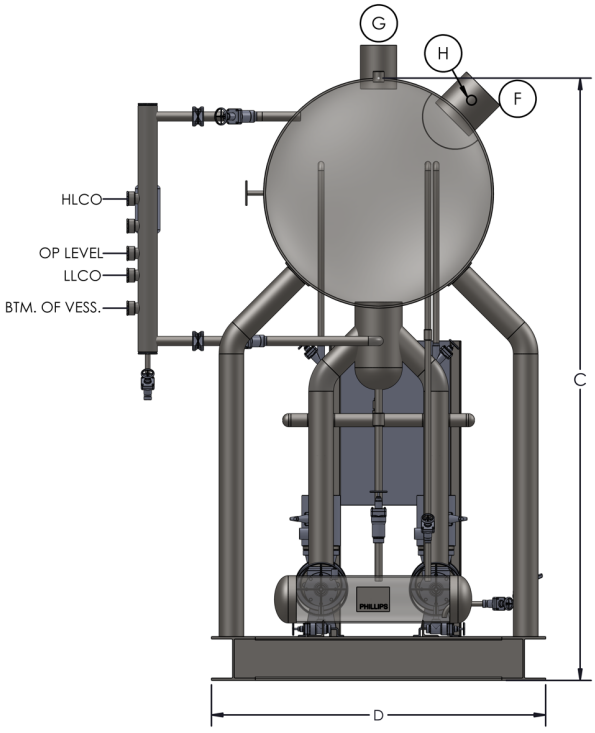
Packaged Mechanical Pump Recirculators

	EVAPORATOR TEMPERATURE, °F										Surge Volume	Estimated Ship Wt
	SINGLE STAGE*						TWO STAGE**					
	30	20	10	0	-10	-20	-20	-30	-40	-50		
PHR24	131	118	106	94	83	73	87	76	66	57	8.7	3100
PHR30	202	182	163	145	128	113	134	117	102	88	14.8	3400
PHR36	313	282	252	225	199	175	208	182	153	127	22.3	3900
PHR42	419	377	337	301	266	234	279	244	212	183	28.7	4200
PHR48	572	514	460	410	363	319	380	333	289	250	39.4	4600
PHR54	737	663	594	529	465	405	477	418	363	313	50.6	5800
PHR60	911	819	733	653	578	509	605	530	461	398	63.9	7300
PHR72	1328	1194	1069	952	843	742	849	744	647	558	90.2	9400
PHR84	1795	1615	1445	1287	1140	1004	1159	1015	883	762	127	13700
PHR96	2354	2117	1895	1688	1495	1316	1518	1320	1148	998	168	15800
PHR108	3031	2727	2345	2089	1850	1628	1936	1695	1474	1272	222	19600
PHR120	3670	3301	2955	2631	2330	2052	2439	2136	1858	1603	276	24600
PHR144	5421	4876	4365	3887	3443	3031	3604	3156	2744	2368	402	36200

* Single stage capacities based on 96ºF liquid supply

** Two stage capacities based on +20ºF liquid supply





Model Number	A OD	B OAL	C Pkg Ht	D Base Width	E Sump	F Wet Suction	G Dry Suction	H Liq. Feed	I Pump Suction	J Oil Pot Drain†	K Relief	L Oil Pot Vent	M Pump Vent/ Cooling	N Bypass	O Oil Pot	LLCO*	OP LEVEL*	HLCO*
PHR24	24	137	90	60	8	6	5	1-1/4	4	1	3/4	3/4	3/4	3/4	8 x 36	4	6	12
PHR30	30	140	96	60	10	8	6	1-1/2	4	1	3/4	3/4	3/4	3/4	8 x 36	4	7	15
PHR36	36	143	102	60	12	8	6	1-1/2	4	1	3/4	3/4	3/4	3/4	8 x 36	4	8	18
PHR42	42	146	110	62	14	10	8	2	4	1	3/4	3/4	3/4	3/4	8 x 36	6	10	21
PHR48	48	149	116	65	14	10	8	2-1/2	4	1	3/4	3/4	3/4	3/4	8 x 36	6	11	24
PHR54	54	152	120	72	16	10	10	2-1/2	4	1	3/4	3/4	3/4	1	8 x 36	6	12	27
PHR60	60	155	126	72	4	12	10	3	5	1-1/4	3/4	3/4	3/4	1	10 x 36	6	13	30
PHR72	72	161	138	84	4	14	12	4	6	1-1/4	3/4	3/4	3/4	1	10 x 36	8	16	36
PHR84	84	167	156	96	4	16	16	4	8	1-1/2	3/4	1	3/4	1	12 x 36	8	18	42
PHR96	96	173	168	96	4	18	16	5	8	1-1/2	3/4	1	3/4	1-1/4	12 x 36	8	20	48
PHR108	108	179	180	96	4	20	18	5	8	1-1/2	1	1	3/4	1-1/4	12 x 36	8	21	54
PHR120	120	185	192	108	4	24	20	6	10	1-1/2	1	1	3/4	1-1/2	12 x 36	8	23	60
PHR144	144	197	216	120	4	24	24	8	12	1-1/2	1-1/4	1	3/4	1-1/2	12 x 36	8	27	72

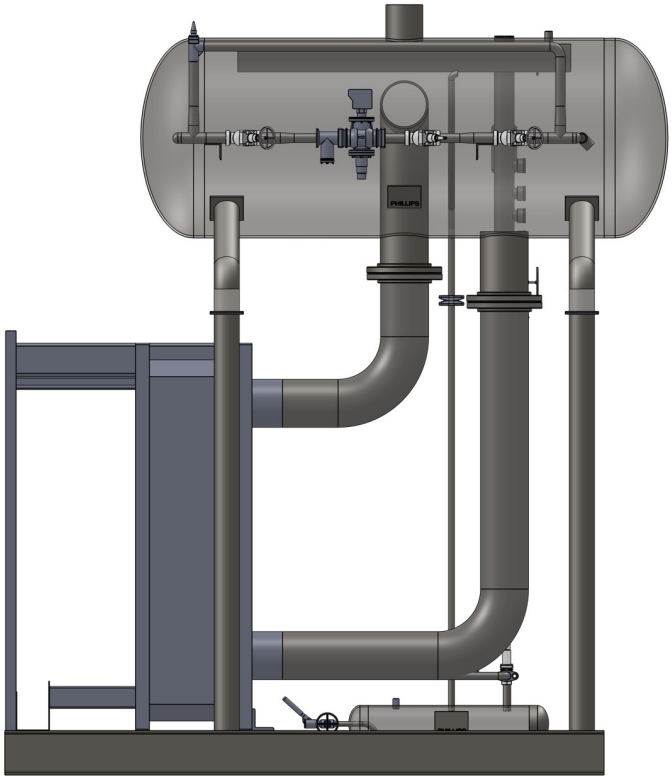
* Dimensions are taken from bottom of vessel

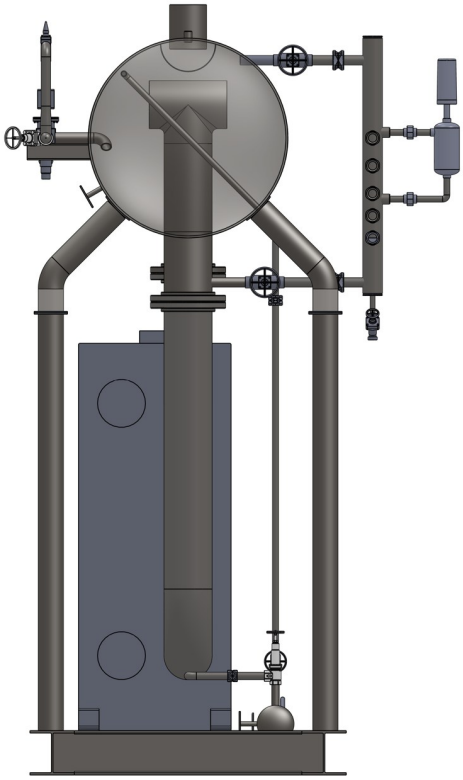
†For temperatures below -20° oil drain size is 1-1/2"

All vessels are custom-built to customer specifications. Vessel dimensions and nozzle sizes in tables are suggestions for nominal conditions.

Plate and Frame Packaged System

Phillips offers packaging of plate and frame-type heat exchangers. We can supply the complete package, or you can have the manufacturer of the heat exchanger ship it to our factory for packaging. Have our expert fitters do the packaging in a controlled factory environment.





STANDARD OFFERINGS:
- Split-flow horizontal surge drum (see ratings on page 2, vessel design on page 17)
- Dual relief assembly for package (ships loose)
- Oil Pot with full trim (relief valve ships loose)
- Valved and flanged level column with Level Eye® sight glasses and factory installed HLCO float switch and drain valve
- Danfoss level sensor and controller
- Danfoss shutoff valves
- Structural steel base
- 1 coat primer and 4-6 mils of engineered epoxy top coat

OPTIONS:
- Liquid makeup valve train
  * Solenoid control with hand expansion bypass loop
  * Motorized valve with solenoid power-loss protection, with hand expansion bypass loop
  * Danfoss ICF valve station
- Electric oil pot heater with integral thermostat, in various voltages and kW
- Stop valves to isolate PHE
- Dual relief assembly for PHE
- Post weld heat treatment of surge drum
- Sandblasting and special coatings
- Alternate level sensors and controllers (Hansen, R/S, others)
- Alternate valve suppliers (Hansen, R/S, others)
- UL/NEMA4 Control Panel

When requesting quote, please indicate PHE selection details (tonnage, suction temperature, and dimensions), as well as desired options.

Concept Sketch Sheet - Level Eye® Column

Column Quote Request

Column OD: ☐ 2” ☐ 2-1/2” ☐ 3”

Shell Length: _____”

Level Eyes

Qty: _____

Type: ☐ 1100C-R ☐ 1100C-RN ☐ 1100C-RNX ☐ _____

Standard Connections:

☐ ¾” Mounted Drain Valve (bottom)

☐ ¾” Probe/Vent (top)

☐ (2) 3/4” Float Switch Mounting Cplgs (side) _____ Sets

☐ (2) 1-1/4” Vessel Mounting Pipes (side) _____ Other Size

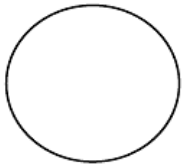
Options:

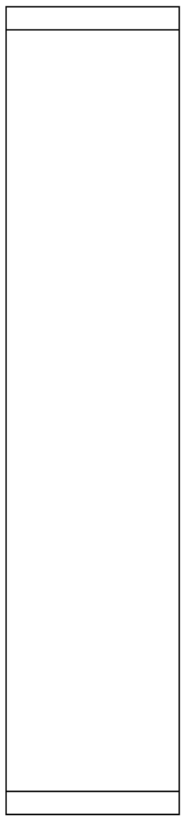
☐ Mounted Float Switch _____ LLSS _____ Other

☐ Other Size Drain Valve _____ Size

☐ Stainless Steel (comes with weld caps)

Other details sketched as needed:





Ref

Concept Sketch Sheet - Horizontal

VESSEL CONCEPT VERIFICATION SKETCH

Vessel OD: _____ in. **Vessel O.A.L.:** _____ in. **Refrigerant:** _____

Vessel Type (check one):

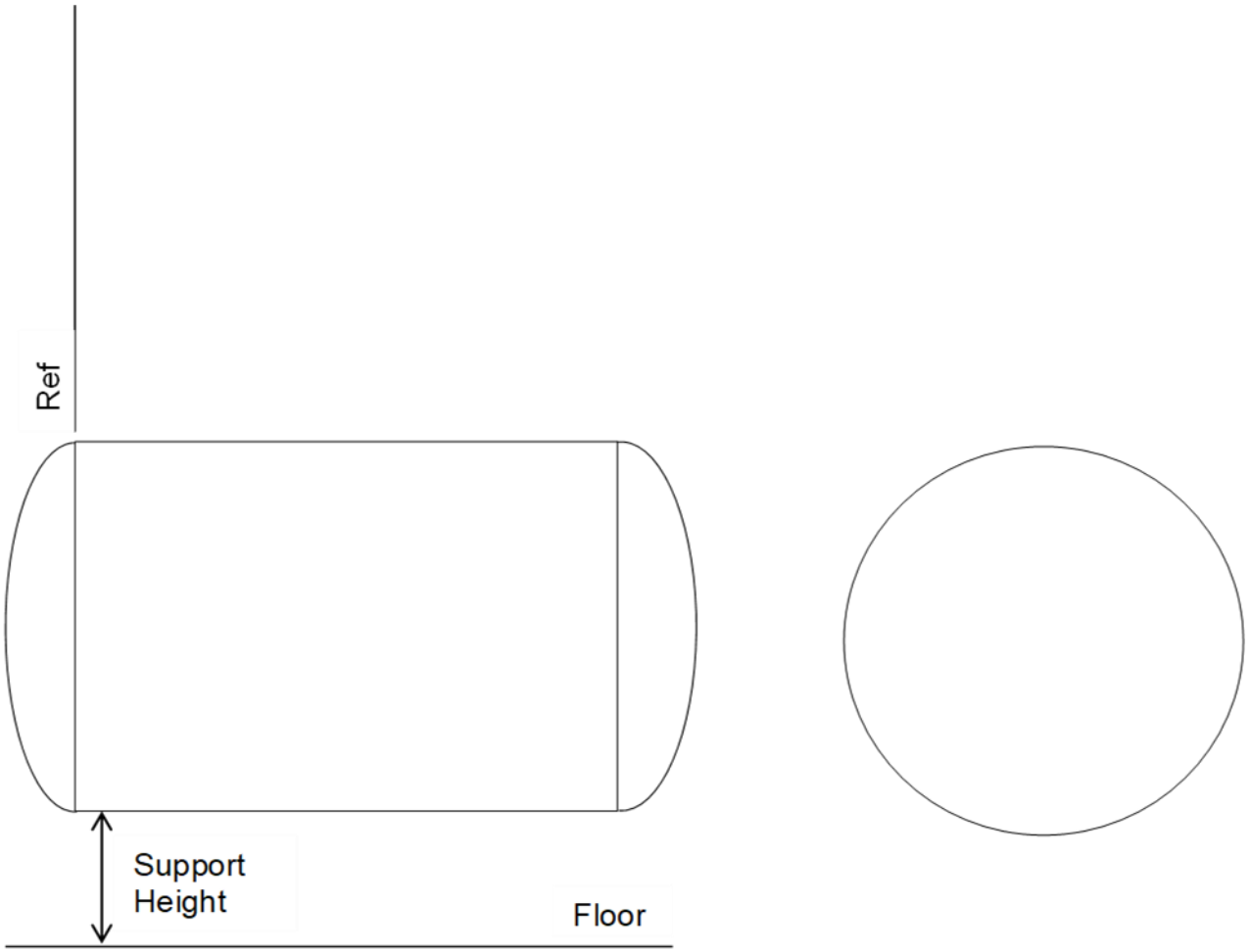
☐Accumulator ☐Receiver ☐Surge Drum

☐Thermosyphon ☐Other:_____

Vessel Support (check one):

☐Full Saddle: Number= _____ ☐Saddle Piece: Number=_____

☐Clips: Number= _____ ☐Other_____ ☐None



Nozzle	Size	Purpose
A		
B		
C		
D		
E		
F		
G		
H		
I		

Note: Sketch any baffles or internals on Drawing.

OPERATING TEMP: _____°F

MAWP: _____°F

VESSEL CONCEPT VERIFICATION SKETCH

Vessel OD: _____ in. **Vessel O.A.H.:** _____ in. **Refrigerant:** _____

Vessel Type (check one):

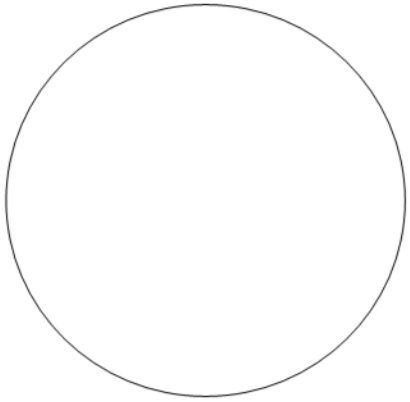
☐Accumulator ☐Receiver ☐Surge Drum ☐CPR ☐Intercooler

☐Thermosyphon ☐Other:_____

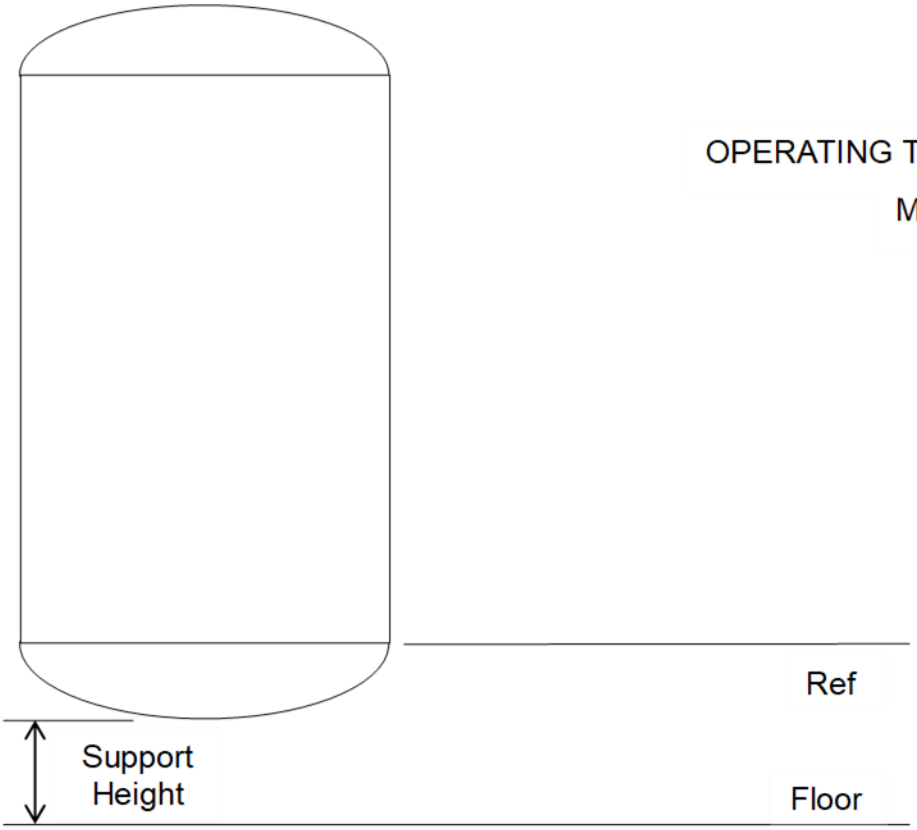
Vessel Support (check one):

☐Pipe Stand (Pedestal): Diameter= _____ in. ☐Clips: Number=_____

☐Legs: Number/Length=____/____ in. (Angle or Channel) ☐None



Nozzle	Size	Purpose
A		
B		
C		
D		
E		
F		
G		
H		
I		

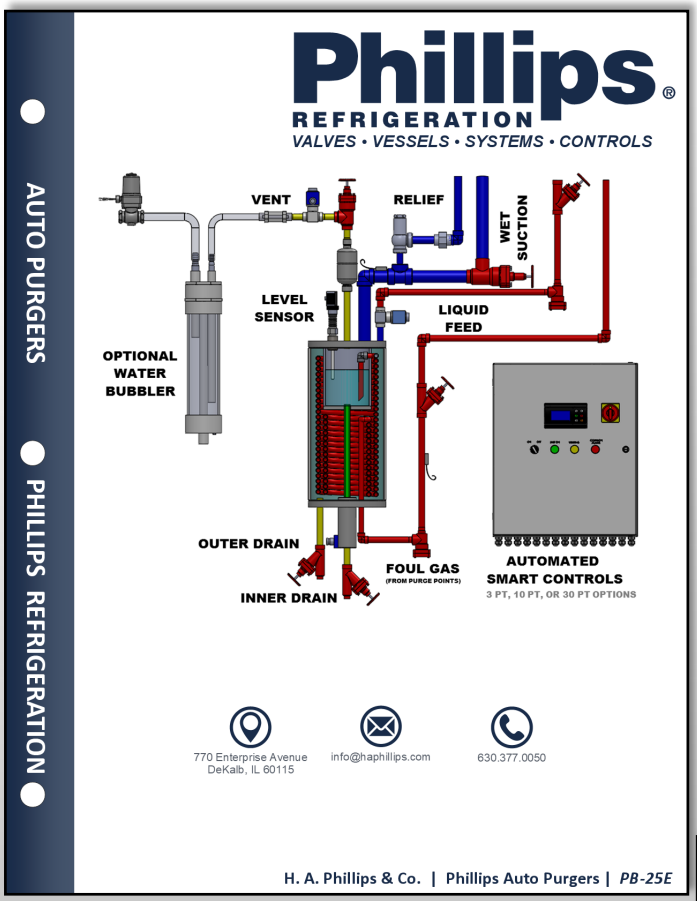


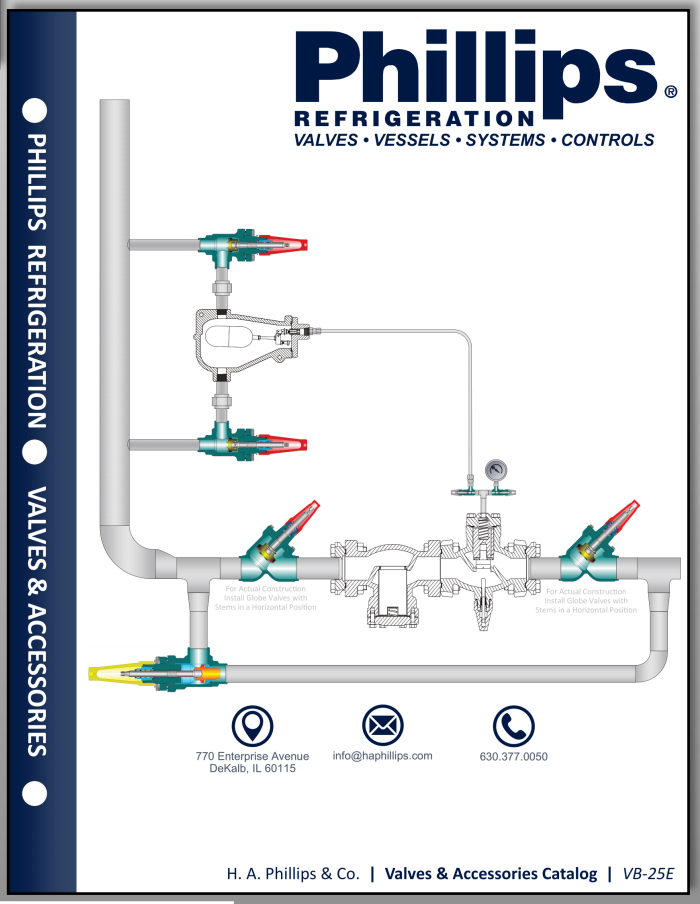
OPERATING TEMP: _____°F

MAWP: _____°F

Note: Sketch any baffles or internals on Drawing.

Be Sure to Check Out Our Other Product Catalog!





ASME "U"

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RETA Member

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