Diaphragm Tank Sizing Guide

HTX and SXHT Series
Hydronic Expansion Tanks

PH and WHV Series
Thermal Expansion Tanks

Wellrite, Challenger, Flexlite Series
Water Well Storage Tanks

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Boyle's Law

All diaphragm tank sizing begins with a basic law of physics known as Boyle's Law. When applied to Hydronic and Thermal expansion tanks it will determine the *acceptance* factor of the tank. When applied to Water well storage tanks it will determine the *drawdown* factor. Boyle's Law is expressed as an equation where;

(P_a divided by P_f) - (P_a divided by P_o) = Acceptance or drawdown factor

Boyle's Law as applied to hydronic and thermal expansion tanks;

when: P_a = pressure in tank before system is filled (plus 14.7 PSI atmospheric pressure)

P_f = minimum operating or fill pressure (plus 14.7 PSI atmospheric pressure)

P_o = maximum operating pressure (plus 14.7 PSI atmospheric pressure)

For pre-pressurized diaphragm type expansion tanks, P_a is equal to P_f so the formula becomes;

1 minus (P_f divided by P_o) = *Acceptance* Factor

Boyle's Law as applied to water well storage tanks;

What is called the *acceptance* factor in hygronic applications, is called the *drawdown* factor in water well applications.

when: P_a = pressure in tank before system is filled (plus 14.7 PSI atmospheric pressure)

P_f = pump cut-in pressure (plus 14.7 PSI atmospheric pressure)

P_o = pump cut-out pressure (plus 14.7 PSI atmospheric pressure)

With all the pre-pressurized diaphragm tanks, Pa is equal to Pf, so the formula is;

1 minus (P_f divided by P_o) = *Drawdown* Factor

HTX & SXHT Sizing

for

Hydronic Heating Systems

Use these tanks when installing a closed loop heating system

Information required:

1. Total system water content _____ gallons
2. Initial fill water temperature _____ F
3. Maximum water temperature _____ F
4. System fill pressure _____ psig
5. Maximum pressure (10% below relief valve) _____ psig

Tank Selection:

6. Enter total system water content (form line 1) _____ gallons
7. Enter expansion factor from Table 1 _____
8. Expanded water volume (line 6 X line 7) _____ gallons
9. Acceptance factor from Table 2 _____
10. Total tank volume required
    (divide line 8 by line 9)

    Line 8 _____ gallons acceptance volume

    Line 10 _____ gallons total tank volume

Select Flexcon tank below which satisfies both line 8 and line 10. For larger systems,multiple tanks may be manifolded together to meet system requirements. For systems containing propylene glycol please contact customer service.

HTX
SERIES

SXHT
SERIES

HTX and SXHT Series					
Model	Total Volume (gallons)	Maximum Acceptance (gallons)	Dimensions		
			Diameter (inches)	Length (inches)	Weight (lbs)
HTX 15	2.1	1.0	8	12.5	5.5
HTX 30	4.5	2.5	11	14.0	10.0
HTX 60	6	3.0	11.4	17.2	11.5
HTX 90	15	6	16	20.8	28.0
SXHT 30	15	6	16	21.7	32.0
SXHT 40	20	8	16	28.8	39.0
SXHT 60	33	13.4	16	42.8	57.0
SXHT 90	44	17.7	21	36.2	72.0
SXHT 110	62	25	21	47.9	112.0
SXHT 160	81	32.6	21	62.0	123.0

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PH & WHV Sizing

for

Domestic Water Heating Systems

Use these tanks with water heaters or radiant heating systems (with non barrier tubing)

PH
SERIES

Information required:

1. Total system water content or water heater x 1.1 _____ gallons
2. Initial fill water temperature _____ F
3. Maximum water temperature _____ F
4. System fill pressure _____ psig
5. Maximum pressure (10% below relief valve) _____ psig

Tank Selection:

6. Enter total system water content (form line 1) _____ gallons
7. Enter expansion factor from Table 1 _____
8. Expanded water volume (line 6 X line 7) _____ gallons
9. Acceptance factor from Table 2 _____
10. Total tank volume required (divide line 8 by line 9)

Line 8 _____ gallons acceptance volume

Line 10 _____ gallons total tank volume

WHV
SERIES

Select Flexcon tank below which satisfies both line 8 and line 10. For larger systems,multiple tanks may be manifolded together to meet system requirements. For systems containing propylene glycol please contact customer service.

PH & WHV Series					
Model	Total Volume (gallons)	Maximum Acceptance (gallons)	Dimensions		
			Diameter (inches)	Length (inches)	Weight (lbs)
PH 5	2.1	1.0	8.5	11.5	7.0
PH 12	4.5	2.0	10.0	15.0	10.0
PH 25	6.0	3.8	12.5	19.2	11.5
WHV 50	15.0	6.3	16.0	21.7	32
WHV 75	20.0	9.0	16.0	28.8	39
WHV 120	33.0	14.4	16.0	27.8	60
WHV 165	44.0	19.8	21.0	36.2	72
WHV 320	81.0	38.3	21.0	44.4	140

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Well Tank Sizing

Use these tanks with domestic water well systems

Information required:

1. Pump capacity in gallons per minute (GPM)
_____ gallons
or storage volume required
2. Pump cut-in pressure
_____ psig
3. Pump cut-out pressure
_____ psig

Tank Selection:

5. Enter drawdown factor from table 3
_____
6. Divide storage volume (line1) by the drawdown factor (line5)
_____ gallons

Select the well tank that satisfies the total volume determined in Line 6.
Or, use the simple table below.

Flexcon Models			Tank Volume (gallons)	Drawdown			Dimensions			Shipping Weight (lbs)
WR (steel)	PC (steel)	FL (composite)		@ 20/40 psig (gallons)	@30/50 psig (gallons)	@40/60 psig (gallons)	Diameter (inches)	Height (inches)	System Connection	
WR45	PC44		14	5.6	4.6	4.1	16	22.0	1”	28.0
		FL 5	15	6.0	5.1	4.4	16.5	25.6	1”	19.0
WR60	PC66		20	8.1	6.8	5.9	16	29.0	1”	36.0
		FL 7	22	8.8	7.5	6.5	16.5	34.1	1”	24.0
WR80	PC88		26	10.5	8.9	7.7	16	34.5	1”	41.0
WR100	PC111		32	12.9	10.9	9.4	21	27.8	1 1/4”	54.0
WR120	PC122		34	13.3	11.3	9.7	16	42.8	1”	49.0
		FL12	35	14.1	11.9	10.3	16.5	48.9	1”	33.5
WR140	PC144		44	17.7	15.0	13.0	21	36.3	1 1/4”	67.0
		FL17	50	20.1	17.0	14.7	21.4	43.3	1 1/4”	47.0
WR200	PC211		62	25.0	21.1	18.3	21	48.0	1 1/4”	82.0
		FL22	65	26.1	22.1	19.1	21.4	51.3	1 1/4”	58.0
		FL28	82	32.6	27.6	23.9	21.4	64.7	1 1/4”	69.5
WR240	PC244		82	32.6	27.6	23.9	21	62.0	1 1/4”	99.0
WR260	PC266		85	34.3	29.0	25.1	26	44.5	1 1/4”	121.0
		FL30	90	36.2	30.6	26.5	24.2	57.0	1 1/4”	77.0
		FL40	119	48.0	40.6	35.1	24.2	72.1	1 1/4”	99.5
WR360	PC366		119	48.0	40.6	35.1	26	59.75	1 1/4”	153.0

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Acceptance and Expansion Factors

Table 1
Expansion Factors

Final Temp, F	Initial Temperature F		
	40	50	60
100	.00575	.00569	.00520
110	.00771	.00765	.00716
120	.01004	.00998	.00949
130	.01236	.01230	.01181
140	.01501	.01495	.01446
150	.01787	.01779	.01730
160	.02092	.02086	.02037
170	.02418	.02412	.02363
180	.02763	.02757	.02708
190	.03127	.03121	.03072
200	.03510	.03504	.03455
210	.03911	.03905	.03856

Table 2
Acceptance Factors
Hydronic and Thermal Tanks

P_o Maximum Operating Pressure (PSIG)	P_f - Minimum Operating Pressure at tank (PSIG)								
	12	20	25	40	50	60	70	80	90
27	.360	.168							
30	.403	.224	.112						
50	.587	.464	.386	.155					
70	.685	.590	.531	.354	.236	.118			
90	.745	.669	.621	.478	.382	.287	.191	.096	
110	.786	.723	.682	.561	.481	.401	.321	.241	.160
130	.815	.760	.726	.622	.553	.484	.415	.346	.277
150	.838	.789	.759	.668	.608	.547	.486	.429	.365

Plain Steel Tank Volumes		
Gallons	Diameter	Length
15	14”	26”
30	14”	49”
40	14”	65”
60	16”	74”
80	20”	64”
100	20”	79”
120	24”	67”
135	24”	75”

Table 3
Drawdown Factors
Water Well Storage Tanks

Cut-out or Final Tank Pressure (PSIG)	Cut-in or Initial Tank Pressure (PSIG)			
	20	30	40	50
40	.366	.183		
50	.464	.309	.155	
60	.535	.402	.268	.134
70	.590	.472	.354	.236
80	.634	.528	.422	.317

Volume of water in gallons per Lineal Foot											
Type	1/2”	3/4”	1”	1 1/4”	1 1/2”	2”	2 1/2”	3”	4'	5	6
Steel Pipe	.016	.028	.045	.078	.105	.172	.250	.385	.667	1.00	1.50
Copper Pipe	.012	.025	.043	.065	.092	.161	.250	.357	.625	1.00	1.40

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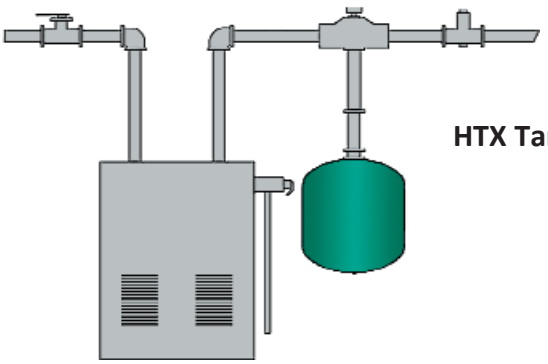
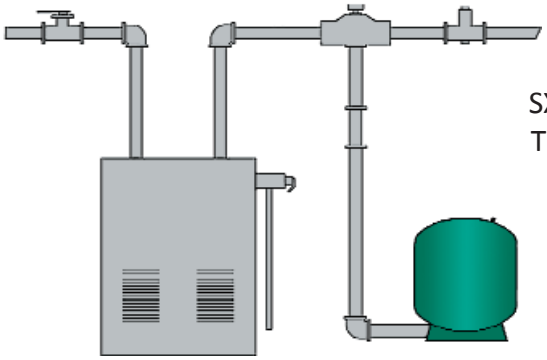
Typical Installations

Hydronic Systems

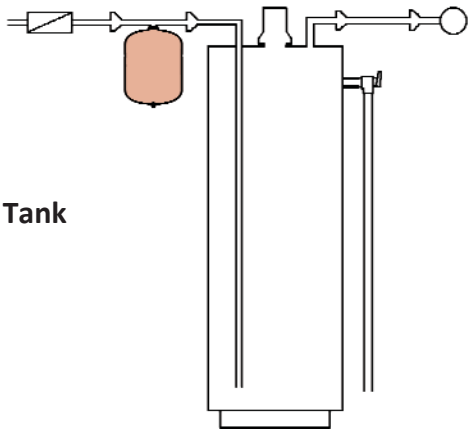


HTX Tank



SXHT Tank

Water Heater Systems



PH Tank

Water Well Storage Systems