



# Refra<sup>®</sup>

## BUFFER TANKS FOR HEAT RECOVERY SYSTEM



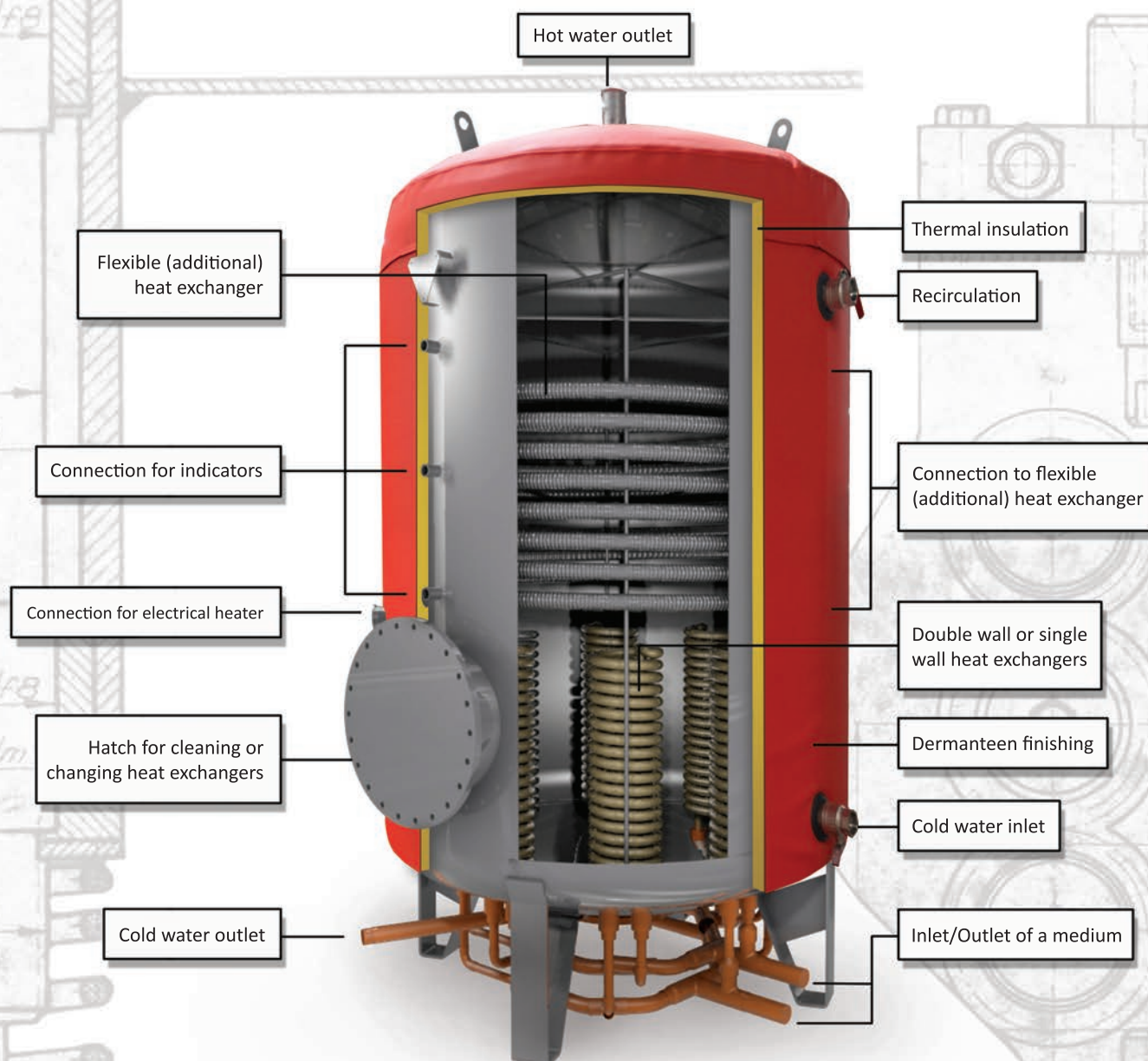
# DESCRIPTION OF THE SYSTEM

Heat Recovery Line is very innovative heat recovery system which is compulsory for progressive business. Today, when energy is consumed in every process, using it in most efficient way is essential for making noticeable savings. JSC "Refra" with Heat Recovery Line is offering wide range of buffers tanks with internal heat exchangers and allows reaching higher results with minimum investments.

Heat Recovery Lines designed by our engineers gives the opportunity to double the benefit gained from the energy you are using in refrigeration processes as heat, is eliminated during them. It can be used for heating sanitary water or fluid you are using for room/floor heaters - everything you need is to have buffer tank with heat recovery system inside. The tank is connected to refrigeration machine and accumulates heat which is abstracted from the process.

By having wide possible range of the buffer tanks with heat recovery system, consumers can be every appliance where heat is needed - starting with buffer tanks from carbon steel just for room heating, floor heating or similar, continuing with stainless steel tanks for sanitary water (showers, wash room, etc.) and finishing at combi – tanks where possible to have flexible hoses, smaller vessel inside or everything combined. Also, all this different solutions can be connected into one system for optimum efficiency on customer need.

Buffer tanks for Heat Recovery Lines are designed and manufactured from high standard materials and components so is reliable and durable.





# STEPS FOR CHOOSING BUFFER TANK FOR HEAT RECOVERY SYSTEM

## 1<sup>st</sup> STEP

In table 1 choose hourly demand of hot water you would like to get from heat recovery system  
Eg. Demand of hot water during continues production is 250 ltr./h

TABLE 1 Production of the hot water according to the capacity

Litres	Number of heat exchangers								Max <sup>***</sup>
	1	2	3	4	5	6	7	8	
300	171 ltr./h <sup>**</sup> 1795 EUR/year	343 ltr./h <sup>**</sup> 3591 EUR/year	514 ltr./h <sup>**</sup> 5387 EUR/year	686 ltr./h <sup>**</sup> 7135 EUR/year	857 ltr./h <sup>**</sup> 8979 EUR/year	1029 ltr./h <sup>**</sup> 10714 EUR/year	1200 ltr./h <sup>**</sup> 12570 EUR/year	1371 ltr./h <sup>**</sup> 14366 EUR/year	399
400									532
500									665
600									799
800									1064
1000									1330
1200									1596
1400									1862
1600									2128
1800									2394
2000									2660

## 4<sup>th</sup> STEP

According to the data in table 1 check the maximum available quantity of hot water in the phase of continues production  
Eg. Model HR500D65 is capable to produce maximum 290 ltr., of hot water in phase of continues production

## 2<sup>nd</sup> STEP

In table 1 choose maximum demand of hot water during rush hour  
Eg. In rush hour (during 7.00-8.00 and 18.00-19.00) demand of hot water is 650 ltr.

TABLE 1 Production of the hot water according to the capacity

Litres	Number of heat exchangers								Max <sup>***</sup>
	1	2	3	4	5	6	7	8	
300	171 ltr./h <sup>**</sup> 1795 EUR/year	343 ltr./h <sup>**</sup> 3591 EUR/year	514 ltr./h <sup>**</sup> 5387 EUR/year	686 ltr./h <sup>**</sup> 7135 EUR/year	857 ltr./h <sup>**</sup> 8979 EUR/year	1029 ltr./h <sup>**</sup> 10714 EUR/year	1200 ltr./h <sup>**</sup> 12570 EUR/year	1371 ltr./h <sup>**</sup> 14366 EUR/year	399
400									532
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800									1064
1000									1330
1200									1596
1400									1862
1600									2128
1800									2394
2000									2660

## 3<sup>rd</sup> STEP

According to the data in table 1 check the maximum production of hot water in 1st hour  
Eg. Model HR500D65 is capable to produce maximum 665 ltr., of hot water in 1st hour.

## 3<sup>rd</sup> STEP

In table 1 according your previous decisions choose the model of the buffer tank  
Eg. If my continues demand is 250 ltr./h and demand in rush hour is 350 ltr./h I choose 500 ltr., buffer tank with 2 internal heat exchangers

TABLE 1 Production of the hot water according to the capacity

Litres	Number of heat exchangers								Max <sup>***</sup>
	1	2	3	4	5	6	7	8	
300	171 ltr./h <sup>**</sup> 1795 EUR/year	343 ltr./h <sup>**</sup> 3591 EUR/year	514 ltr./h <sup>**</sup> 5387 EUR/year	686 ltr./h <sup>**</sup> 7135 EUR/year	857 ltr./h <sup>**</sup> 8979 EUR/year	1029 ltr./h <sup>**</sup> 10714 EUR/year	1200 ltr./h <sup>**</sup> 12570 EUR/year	1371 ltr./h <sup>**</sup> 14366 EUR/year	399
400									532
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800									1064
1000									1330
1200									1596
1400									1862
1600									2128
1800									2394
2000									2660

## 2<sup>nd</sup> STEP

In table 1 according your previous decisions find the model you choose in table 2  
Eg. In table 2 model HR500D65 is chosen

## 4<sup>th</sup> STEP

In table 2 check the cooling capacity of compressor rack needed for particular model of buffer tank  
Eg. For 500 ltr., buffer tank with 2 internal heat exchangers cooling capacity not less than 18 kW is needed (when Evaporating temp./Condensing temp. -10°C/+45°C) or not less 24 kW (when Evaporating temp./Condensing temp. -35°C/+45°C)

TABLE 2 Technical data

Model	Number of heat exchangers <sup>a</sup>								Volume	Diameter	H	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	H <sub>4</sub>
	1	2	3	4	5	6	7	8	dm <sup>3</sup>	mm	mm	mm	mm	mm	mm
HR300D65	9 kW	18 kW	22 kW	27 kW	37 kW	47 kW	57 kW	68 kW	300	650	1260	140	840	380	814
HR400D65									400		1560				760
HR500D65									500		1860				700
HR600D65									600		2160				640
HR800D65									800		2460				580
HR1000D65	13 kW	24 kW	30 kW	37 kW	47 kW	57 kW	68 kW	79 kW	1000	850	2760	110	860	390	812
HR1200D110									1200		3060				742
HR1400D110									1400		3360				672
HR1600D110									1600		3660				876
HR1800D110									1800		3960				836
HR2000D110	17 kW	30 kW	37 kW	47 kW	57 kW	68 kW	79 kW	89 kW	2000	1100	4260	100	900	430	796
HR2200D110									2200		4560				746
HR2400D110									2400		4860				706
HR2600D110									2600		5160				706
HR2800D110									2800		5460				706

## 1<sup>st</sup> STEP

In table 2 check the cooling capacity of compressors rack needed for particular model of buffer tank  
Eg. For 500 ltr., buffer tank with 2 internal heat exchangers cooling capacity not less than 18 kW is needed (when Evaporating temp./Condensing temp. -10°C/+45°C) or not less 24 kW (when Evaporating temp./Condensing temp. -35°C/+45°C)



**TABLE 1** Production of the hot water according to the capacity

Litres	Number of heat exchangers								Max**
	1	2	3	4	5	6	7	8	
300	145 ltr./h* 1215 EUR/year	290 ltr./h* 2430 EUR/year	437 ltr./h* 3662 EUR/year	583 ltr./h* 4885 EUR/year	728 ltr./h* 6100 EUR/year	874 ltr./h* 7324 EUR/year	1020 ltr./h* 8547 EUR/year	1165 ltr./h* 9762 EUR/year	399
400									532
500									665
600									789
800									1064
1000									1330
1200									1596
1400									1862
1600									2128
1800									2394
2000									2660

\* Continues water production when  $\Delta t = 50^{\circ}\text{C}$ ; Saving per year under the price 0,04 €/kWh of gas

\*\* Maximum available quantity of hot water in 1st hour (during rush hour)

**TABLE 2** Technical data

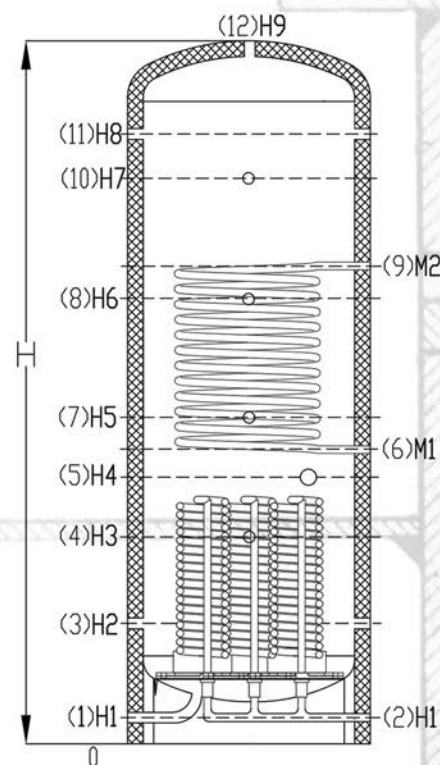
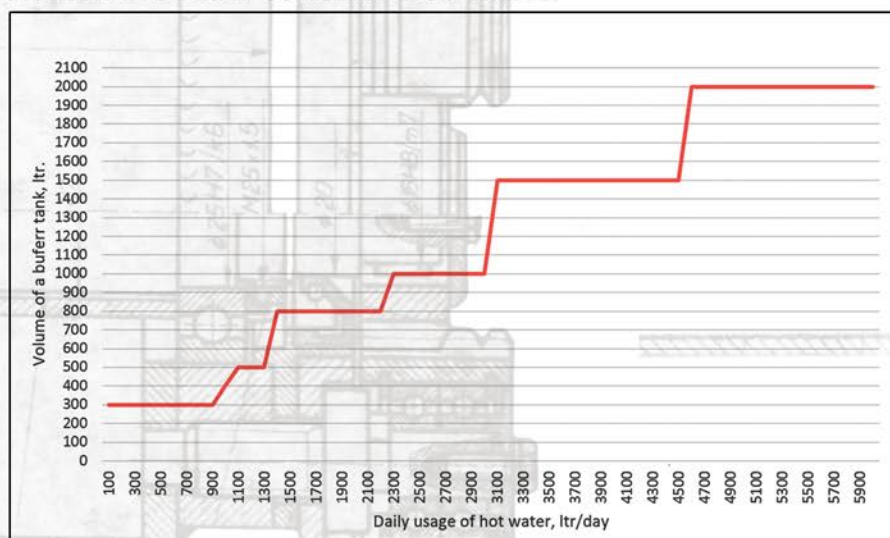
Model	Number of heat exchangers*								Volume dm <sup>3</sup>	Diameter mm	H mm	H <sub>1</sub> mm	H <sub>2</sub> mm	H <sub>3</sub> mm	H <sub>4</sub> mm	H <sub>5</sub> mm	H <sub>6</sub> mm	H <sub>7</sub> mm	H <sub>8</sub> mm	H <sub>9</sub> mm	M <sub>1</sub> mm	M <sub>2</sub> mm
	1	2	3	4	5	6	7	8														
HR300D65	9 kW Ø16 mm	18 kW Ø22 mm	22 kW Ø28 mm	37 kW Ø28 mm					300	650	1260	140	840	380	814	866	918	970	990	1260	-	-
HR400D65									400		1560				760	920	1080	1240	1260	1560	890	1075
HR500D65									500		1860				700	980	1260	1540	1560	1860		1225
HR600D65									600		2160				640	1040	1440	1840	1860	2160		1375
HR600D85	13 kW Ø16 mm	24 kW Ø22 mm	30 kW Ø28 mm	45 kW Ø28 mm	47 kW Ø35 mm				600	850	1430	110	860	390	812	908	1004	1100	1120	1430	910	1015
HR800D85									800		1780				742	978	1214	1450	1470	1780		1190
HR1000D85									1000		2130				672	1048	1424	1800	1820	2130		1365
HR1000D110									1000		1420	100	900	430	876	924	972	1020	1040	1420	950	1095
HR1200D110						52 kW Ø35 mm	68 kW Ø35 mm	79 kW Ø42 mm	1200		1620				836	964	1092	1220	1240	1620		1195
HR1400D110									1400		1820				796	1004	1212	1420	1440	1820		1275
HR1600D110									1600		2070				746	1054	1362	1670	1690	2070		1320
HR1800D110									1800		2270				706	1094	1482	1870	1890	2270		1420
HR2000D110									2000		2440				672	1128	1584	2040	2060	2440		1505

\* Double wall heat exchanger which certified under the Pressure Equipment Directive 97/23/EC, Quality Directive DIN EN ISO 3001 and can be used under Higen Directive B  
COMPRESSOR'S PACK COOLING CAPACITY, kW (refrigerant R404a) Evaporating temp./Condensing temp: -10°C/+45°C Evaporating temp./Condensing temp: -35°C/+45°C



# TECHNICAL DATA

## RECOMENDED BUFFER TANK VOLUME ACCORDING DAILY USAGE OF HOT WATER



Area of additional heat exchanger, m <sup>2</sup>	Length of additional heat exchanger, m	Diameter of additional heat exchanger, mm
-	-	-
0,9	4,69	30
1,7	8,86	
2,4	12,50	
0,7	3,65	
2,0	10,42	
3,2	16,67	
1,5	7,81	
2,5	13,02	
3,3	17,19	
3,7	19,27	
4,7	24,48	
5,6	29,17	

1	Drain 3/4" (1" from 1000 litres)	7	Mechanical thermometer 1/2"
2	Domestic Cold water inlet 1" (1 1/2" from 1000 litres)	8	Connection for recirculation 1" (1 1/2" from 1000 litres)
3	Probe 1/2"	9	Domestic Hot water outlet 1" (1 1/2" from 1000 litres)
4	Electrical heating unit 1 1/2"	10	Connection for refrigerant heat exchanger, D = 22mm
5	Anode 1/2"	11	Primary circuit inlet (outlet) 1"
6	Pressure gauge 1/2"	12	Primary circuit outlet (inlet) 1"

WHILE ORDERING THE HEAT RECOVERY TANK,  
PLEASE PROVIDE THE FOLLOWING CODE:

<b>HR</b>	<b>V</b>	<b>800</b>	<b>D85</b>	<b>/4</b>	<b>D</b>	<b>-FH</b>	<b>2.0</b>
TYPE HR-Heat recovery	POSITIONING V-Vertical; H-Horizontal	VOLUME From 300 ltr. till 2000 ltr., according to the catalog	DIAMETER D65-650 mm; D85-850 mm; D110-1100 mm	NO. OF HEAT EXCHANGERS From 1 pcs., till 8 pcs	TYPE OF HEAT EXCHANGER D - Double wall; S - Single wall	MATERIAL FG - Carbon Steel S235JR; FH - Stainless Steel AISI304; FJ - Stainless Steel AISI316	SURFACE OF ADDITIONAL HEAT EXCHANGER From 0.9 m <sup>2</sup> till 5.6 m <sup>2</sup> according to the drawing

EN 12897:2000

°C



# MATERIALS USED IN THE PRODUCTION

## METAL SHEET

Top class carbon and stainless steel (AISI 304; AISI 316) brought from certified institutions which is specially produced to obtain maximum effectiveness from the buffer tank. During the design process optimum thickness of the sheet metal is selected for better price and working conditions.

## THERMAL INSULATION

According to the requirement we can insulate buffer tanks with 2 types of insulation: Armaflex for cooling systems with thickness from 40 mm up to 80 mm or Polyurethane for heating systems from 50 mm up to 100 mm. High thermal conductivity ( $\lambda = 0.035 \text{ W/mk}$ ) allow to have minimum heat losses. Leather finishing makes the product's final look extremely representative and exclusive.

## HEAT EXCHANGERS

Inner heat exchangers made from finned tubes can be double wall for safety reasons when buffer tank accumulates sanitary hot water or single wall where extra safety is not needed. Working pressure for these exchangers are 35 bar, temperature till  $130^{\circ}\text{C}$ .

Flexible (additional) heat exchanger also adapted for sanitary water made of AISI 316. Corrugated surface increases heat exchanger's surface area and allows reach bigger capacity by having effective heat exchanges. Working pressure 10 bar and working temperature  $130^{\circ}\text{C}$  allows to prepare best quality hot water inside it.

## ACCESSORIES

If required, the offer for the buffer tank can be prepared with all the additional components special for your project - thermometers, manometers, valves, etc., is always on stock.

## NON STANDARD DESIGN

Nonstandard solutions are also welcome – our design and engineering department will offer you the best solution for your system by preparing hydraulic diagrams, detailed drawing, technical data sheets with all needed certificates.



# EXAMPLE OF HEAT RECOVERY SYSTEM

