

DANKOFF ETAPUMP®



SOLAR SUBMERSIBLE PUMPS

VERSION 2.2, SEPTEMBER 2002

The world's most economical solar pumps

Lift from as deep as 650 feet (200m)

Maximum 16,000 gallons per day (60 cu.m.)

ETAPUMP eliminates the costs of fuel delivery, engine maintenance, and pollution.

In many cases it is **LESS COSTLY** than a conventional pump and generator installation!

- Great reliability and life expectancy
- Only one moving part, brushless motor
- High resistance to sand and corrosion
- Fits 4" and larger well casings

HIGH EFFICIENCY = LOWER COST

ETA is a Greek letter that engineers use to represent ENERGY EFFICIENCY.

In solar pumping, HIGH ETA = LOW SYSTEM COST.

ETAPUMP uses a solar array of 20-50% less power than other solar pumps, to do the same work. It is the most economical solar submersible pump available today.

RELIABLE AND MAINTENANCE-FREE

ETAPUMP has only one moving part—no failure-prone diaphragms or motor brushes to replace.

ALL electronic control parts are above ground for easy access and greatest reliability. Be cautious of solar pumps with controls sealed inside the motor—if one tiny part fails, the pump must be pulled and the whole motor replaced.

ETAPUMP INTEGRATED SYSTEM™ is complete and ready to install

An ETAPUMP INTEGRATED SYSTEM is a complete system kit, engineered for the lift and daily volume that you require. It includes premium crystalline UL-listed solar modules (panels) with a life expectancy beyond 30 years. The solar array rack (or optional tracker) is engineered for 90 MPH (145 km/h) wind. The controller is weather-sealed for all climates.

SYSTEM INSTALLATION

Install the pump by the same methods and materials used for conventional submersible pumps. The solar array requires nuts-and-bolts assembly and standard wiring practice. The ETAPUMP instruction manual is clearly illustrated. No special product training is required.



NOW TO 650 FEET
(200m)

ETAPUMP INTEGRATED SYSTEM™
Components vary according to the system number

"I'm very satisfied with ETAPUMP. My local pump installer was very impressed, and agreed that this is a step up for the solar pumping world."

G.P., remote home owner, California

ETAPUMP INTEGRATED SYSTEM™ INCLUDES

- Pump and controller
- Solar modules (panels)
- Solar array mounting rack (top-of-pole)
- Solar array disconnect switch
- Submersible cable splice kit
- Low-water probe
- Detailed, illustrated instruction manual

THE FOLLOWING ITEMS ARE NOT INCLUDED.
They are available from local suppliers.

- Steel pole and concrete to support the solar array (schedule 40 pipe, size and length specified in the rack instructions)
- Drop pipe (refer to a pipe sizing chart)
- Submersible pump cable, 3-wire + ground
- Water well safety rope (1/4")
- Wire and standard electrical hardware

ETAPUMP INTEGRATED SYSTEMS™ SIZING TABLE

FOR NON-BATTERY SYSTEMS *

VERSION 2.2
SEPTEMBER 6, 2002

VERTICAL LIFT	25 Feet <i>8m</i>		50 Feet <i>15m</i>		75 Feet <i>23m</i>		100 Feet <i>30m</i>		125 Feet <i>38m</i>		150 Feet <i>46m</i>		175 Feet <i>53m</i>			
	gallons per day	<i>cubic m. per day</i>	gallons per day	<i>cubic m. per day</i>	gallons per day	<i>cubic m. per day</i>	gallons per day	<i>cubic m. per day</i>	gallons per day	<i>cubic m. per day</i>	gallons per day	<i>cubic m. per day</i>	gallons per day	<i>cubic m. per day</i>		
PEAK	7.5	1300	4.8	920	3.5	710	2.7	450	1.7							
SUN	6.0	1030	3.9	660	2.5	480	1.8	260	1.0							
hours/day	4.5	710	2.7	400	1.5	260	1.0	160	0.6							
SYSTEM #	ETA-04-090															
GPM	<i>lpm</i>	2.8	10.5	2.6	10.0	2.1	8.0	2.0	7.5							
Wire size/max. length	#12 / 170 ft.															
PEAK	7.5	1660	6.3	1190	4.5	1060	4.0	790	3.0	530	2.0					
SUN	6.0	1370	5.2	1060	4.0	770	2.9	500	1.9	290	1.1					
hours/day	4.5	1000	3.8	690	2.6	480	1.8	260	1.0	210	0.8					
SYSTEM #	ETA-04-120															
GPM	<i>lpm</i>	3.2	12.0	3.0	11.5	2.7	10.4	2.1	8.1	2.1	8.0					
Wire size/max. length	#12 / 170 ft.															
PEAK	7.5	3040	11.5	1560	5.9	1530	5.8	1160	4.4	980	3.7	820	3.1	630	2.4	
SUN	6.0	2380	9.0	1450	5.5	1270	4.8	1000	3.8	710	2.7	550	2.1	400	1.5	
hours/day	4.5	1190	4.5	1160	4.4	900	3.4	660	2.5	420	1.6	260	1.0	180	0.7	
SYSTEM #	ETA-14-180							ETA-04-180								
GPM	<i>lpm</i>	7.4	28.0	2.6	10.0	2.6	10.0	2.4	9.2	2.3	8.8	3.0	11.5	2.9	10.8	
Wire size/max. length	#12 / 80 ft.			#14 / 138 ft.				#12 / 215			#10 / 280					
PEAK	7.5	4490	17.0	3430	13.0	2380	9.0	1660	6.3	1370	5.2	1110	4.2	980	3.7	
SUN	6.0	3430	13.0	2460	9.3	1690	6.4	1400	5.3	1060	4.0	850	3.2	690	2.6	
hours/day	4.5	2640	10.0	1160	4.4	1370	5.2	980	3.7	710	2.7	500	1.9	370	1.4	
SYSTEM #	ETA-14-240							ETA-04-240								
GPM	<i>lpm</i>	9.8	37.0	7.9	30.0	6.6	25.0	3.6	13.5	3.1	11.8	2.7	10.4	2.6	9.8	
Wire size/max. length	#12 / 80 ft.			#12 / 120 ft.				#12 / 216 ft.			#10 / 280 ft.					
PEAK	7.5	5810	22.0	4230	16.0	3170	12.0	1820	6.9	1640	6.2	1510	5.7	1290	4.9	
SUN	6.0	4490	17.0	3570	13.5	2110	8.0	1660	6.3	1450	5.5	1220	4.6	1000	3.8	
hours/day	4.5	3430	13.0	2510	9.5	1060	4.0	1320	5.0	980	3.7	710	2.7	580	2.2	
SYSTEM #	ETA-14-300							ETA-04-300								
GPM	<i>lpm</i>	10.8	41.0	9.8	37.0	8.2	31.0	3.6	13.6	3.5	13.2	3.4	12.8	3.3	12.5	
Wire size/max. length	#12 / 80 ft.			#10 / 150 ft.				#12 / 240			#10 / 280 ft.					
PEAK	7.5	8450	32.0	6530	24.7	5280	20.0	4100	15.5	2910	11.0	2510	9.5	2220	8.4	
SUN	6.0	7130	27.0	5280	20.0	4490	17.0	3170	12.0	2110	8.0	1850	7.0	1590	6.0	
hours/day	4.5	4760	18.0	3960	15.0	3170	12.0	2010	7.6	1530	5.8	1190	4.5	1060	4.0	
SYSTEM #	ETA-75C-480				ETA-14-480				ETA-04-480 <small>Use ETA-04-480 with #12/240 ft.</small>				ETA-07-480			
GPM	<i>lpm</i>	20.6	78.0	11.9	45.0	10.8	41.0	9.5	36.0	4.8	18.0	5.5	21.0	5.0	19.0	
Wire size/max. length	#10 / 130 ft.							#8 / 150 ft.			#10 / 190 ft.					
PEAK	7.5	11620	44.0	8450	32.0	6340	24.0	5150	19.5	4230	16.0	3430	13.0	2910	11.0	
SUN	6.0	10040	38.0	6340	24.0	5550	21.0	4230	16.0	3170	12.0	2640	10.0	2380	9.0	
hours/day	4.5	6610	25.0	4230	16.0	4230	16.0	2910	11.0	1980	7.5	1850	7.0	1720	6.5	
SYSTEM #	ETA-75C-600			ETA-107C-600			ETA-14-600									
GPM	<i>lpm</i>	23.8	90.0	19.8	75.0	11.9	45.0	11.4	43.0	9.5	36.0	11.0	41.5	7.7	29.0	
Wire size/max. length	#12 / 55ft				#10 / 130 ft.				#8 / 230				#8 / 193 ft.			
PEAK	7.5	14530	55.0	10040	38.0	6340	24.0	5810	22.0	5020	19.0	4230	16.0	3430	13.0	
SUN	6.0	12420	47.0	7930	30.0	5810	22.0	5020	19.0	4360	16.5	3430	13.0	2380	9.0	
hours/day	4.5	8980	34.0	5550	21.0	4760	18.0	3700	14.0	2910	11.0	2030	7.7	1190	4.5	
SYSTEM #	ETA-75C-720						ETA-14-720									
GPM	<i>lpm</i>	29.1	110.0	22.5	85.0	11.9	45.0	11.9	45.0	10.6	40.0	11.0	41.5	10.8	41.0	
Wire size/max. length	#12 / 65 ft.				#10 / 130				#8 / 230 ft.				#8 / 207 ft.			
PEAK	7.5	16380	62.0	12420	47.0	7930	30.0	6100	23.1	5550	21.0	5020	19.0	4520	17.1	
SUN	6.0	14530	55.0	10040	38.0	6610	25.0	5810	22.0	5020	19.0	4230	16.0	3590	13.6	
hours/day	4.5	11360	43.0	7130	27.0	4230	16.0	5020	19.0	4020	15.2	2640	10.0	2110	8.0	
SYSTEM #	ETA-75C-900					ETA-107C-900		ETA-14-900								
GPM	<i>lpm</i>	29.1	110.0	26.4	100.0	17.7	67.0	11.9	45.0	11.1	42.0	10.6	40.0	10.0	38.0	
Wire size/max. length	#10 / 125					#10 / 174		#10 / 160			#8 / 207 ft.					

M O R E
W A T E R



Dankoff Solar Products, Inc.
Santa Fe, NM USA
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LIFT LIMITS

These systems are selected for optimum performance. To allow unexpected drawdown, each system can handle an additional 15% lift.

*** FOR BATTERY SYSTEMS**
24V and 48V
request additional data sheet

HOW DAILY WATER VOLUME IS CALCULATED

Daily volume is calculated by integrating real flow vs. realistic solar (PV) output through the day. (peak sun hours/day = kWh/sq.m/day)

Calculations are for WORST-CASE CONDITIONS. PV output is degraded 28% for heat (cell temp. 60°C), dust, and manufacturer's lowest guaranteed output. Cable losses are included at maximum allowable length. The solar array is fixed at tilt angle = latitude of the location. For central USA, seasonal adjustment of the tilt angle increases daily volume by about 8% summer, 5% winter. Flow rates may vary +/- 10%.

Specifications are subject to change. Please use the newest version.

200 Feet 61m		250 Feet 76m		300 Feet 91m		350 Feet 107m		400 Feet 122m		450 Feet 137m		500 Feet 152m		550 Feet 167m		600 Feet 183m		650 Feet 200m	
gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day	gallons per day	m. per day

INSTRUCTIONS
(1) Find the LIFT you require, and read the column below it.

Daily solar radiation:
7.5 = moderately dry summer weather

(2) Find the DAILY VOLUME you require.
at 7.5 peak sun hrs/day - gal/day cu.m/day
at 6.0 peak sun hrs/day - gal/day cu.m/day
at 4.5 peak sun hrs/day - gal/day cu.m/day
(For more water, look further down the column.)

(3) Order this SYSTEM NUMBER

(4) Use the PEAK FLOW RATE for pipe sizing.
GPM lpm

(5) Wire size / max. length (see below)

420	1.6																			
240	0.9																			
130	0.5																			
ETA-04-180																				
2.0	7.5																			
#10 / 280 ft.																				

790	3.0	530	2.0	480	1.8	400	1.5													
530	2.0	370	1.4	340	1.3	260	1.0													
260	1.0	210	0.8	130	0.5	80	0.3													
ETA-04-240		ETA-03H-240																		
2.3	8.6	1.5	5.5	1.4	5.2	1.3	4.8													
#10 / 280 ft.		#10 / 330 ft.				#8 / 370 ft.														

1110	4.2	900	3.4	690	2.6	580	2.2	530	2.0	450	1.7	400	1.5									
770	2.9	610	2.3	530	2.0	420	1.6	370	1.4	320	1.2	290	1.1									
420	1.6	210	0.8	370	1.4	260	1.0	180	0.7	130	0.5	80	0.3									
ETA-04-300				ETA-03H-300																		
2.8	10.5	2.2	8.3	1.7	6.5	1.6	5.9	1.4	5.4	1.3	5.0	1.2	4.7									
#10 / 280 ft.		#10 / 330 ft.				#8 / 500 ft.																

1900	7.2	1450	5.5	1320	5.0	1160	4.4	1000	3.8	870	3.3	790	3.0	710	2.7	630	2.4	550	2.1	
1450	5.5	1160	4.4	980	3.7	820	3.1	710	2.7	690	2.6	610	2.3	500	1.9	450	1.7	400	1.5	
1060	4.0	740	2.8	580	2.2	450	1.7	400	1.5	550	2.1	480	1.8	400	1.5	340	1.3	260	1.0	
Use ETA-04-480 with #10/280 ft.		ETA-04-480				ETA-04H-480				ETA-03H-480										
4.6	17.5	3.4	12.8	3.0	11.5	2.9	11.0	2.5	9.5	1.9	7.2	1.8	7.0	1.8	6.8	1.4	5.2	1.3	4.9	
#8 / 300 ft.		#8 / 330 ft.				#6 / 420 ft.				#8 / 850 ft.										

2400	9.1	2010	7.6	1590	6.0	1370	5.2	1190	4.5	1060	4.0	920	3.5	850	3.2	790	3.0	710	2.7	
1930	7.3	1590	6.0	1320	5.0	1220	4.6	1000	3.8	920	3.5	820	3.1	710	2.7	660	2.5	580	2.2	
1320	5.0	1110	4.2	1030	3.9	870	3.3	660	2.5	530	2.0	630	2.4	530	2.0	420	1.6	370	1.4	
ETA-07-600				ETA-04H-600								ETA-03H-600								
5.3	20.0	5.2	19.5	3.4	13.0	3.3	12.5	3.3	12.5	3.2	12.0	1.9	7.1	1.8	7.0	1.8	6.9	1.8	6.8	
#8 / 276 ft.		#6 / 545 ft.				#6 / 490 ft.				#8 / 500 ft.				#8 / 650 ft.						

2510	9.5	2380	9.0	2010	7.6	1610	6.1	1510	5.7	1370	5.2	1240	4.7	980	3.7	870	3.3	820	3.1	
2320	8.8	2010	7.6	1510	5.7	1320	5.0	1220	4.6	1110	4.2	1000	3.8	820	3.1	770	2.9	710	2.7	
1660	6.3	1400	5.3	870	3.3	1000	3.8	820	3.1	710	2.7	610	2.3	710	2.7	630	2.4	580	2.2	
ETA-07-720				ETA-04H-720								ETA-03H-720								
5.3	20.0	5.2	19.5	5.0	19.0	3.3	12.5	3.2	12.2	3.2	12.0	3.1	11.8	1.8	7.0	1.8	6.9	1.8	6.8	
#8 / 303 ft.		#6 / 545 ft.				#6 / 490 ft.				#8 / 500 ft.				#8 / 650 ft.						

2800	10.6	2640	10.0	2430	9.2	1740	6.6	1610	6.1	1530	5.8	1430	5.4	1000	3.8	950	3.6	920	3.5	
2640	10.0	2430	9.2	2030	7.7	1590	6.0	1450	5.5	1350	5.1	1240	4.7	950	3.6	900	3.4	870	3.3	
2030	7.7	1850	7.0	1320	5.0	1290	4.9	1110	4.2	980	3.7	870	3.3	850	3.2	820	3.1	740	2.8	
ETA-07-900				ETA-04H-900								ETA-03H-900								
5.3	20.0	5.2	19.5	5.0	19.0	3.3	12.5	3.2	12.2	3.2	12.0	3.1	11.8	1.8	7.0	1.8	6.9	1.7	6.6	
#8 / 317 ft.		#6 / 565 ft.				#6 / 545 ft.				#8 / 500 ft.				#8 / 650 ft.						

SOLAR ARRAY POLE SIZE

ETA#	Sched40
last 3 digits	pipe size
090,120	2.5"
180-600	4"
720,900	6"
for solar tracker, size may vary	

PUMP OUTLET PIPE SIZE

ETA#	NPT
contains	inches
"C"	1 1/4"
ETA-14	1 1/4"
all others	1"

WIRE SIZES
PUMP CABLE, EXAMPLE: #6 = AWG (American Wire Gauge) / 565 = maximum allowable length (controller to pump) for that wire size.

PUMP CABLE VARIATION
GREATER LENGTH (to 150%) — use the next larger wire size.
SHORTER LENGTH (67% or less) — can use next smaller wire.

ARRAY TO CONTROLLER if <20 ft. (3m): #10 minimum
CONTROLLER TO LOW-WATER PROBE: #18 min. 1-conductor
CONTROLLER TO FLOAT SWITCH: #18 min. 2-conductor

METRIC WIRE
nearest larger

AWG	mm ²
#18	1
#12	4
#10	6
#8	10
#6	16

DEEP WELL APPLICATIONS

ETAPUMP can be submersed as deep as necessary to ensure reliable water supply.

SURFACE WATER APPLICATIONS

ETAPUMP can be submersed in any position, in a stream, pond, tank or shallow well. This eliminates any need for a pump house or for periodic priming.

DRY RUN PROTECTION

A low water sensor (included) turns pump off to prevent dry-run damage. Reset is automatic.

SAND AND SILT TOLERANCE

ETAPUMP has high resistance to wear from sand, clay, etc. that may occur in a properly constructed water well. However, extremely turbid water (greater than 2% solids by volume) may cause blockage in the pump or the drop pipe, especially at low flow rates. Do not use ETAPUMP to clean out a dirty well.

CONTROLLER DISPLAY

LED lights indicate: System–ON, Pump–ON, Full Tank–OFF and Low Water Source–OFF

STORAGE REQUIREMENT

A storage tank (not included) should be sized to supply a minimum of 5-10 days' water supply, depending on climate and application. Water storage is generally more economical than energy storage in batteries.

BATTERY SYSTEMS

ETAPUMP battery versions are appropriate for pressurizing systems or where a storage tank is not desirable. Request a battery version data sheet. Voltages available: 24 and 48V.

PIPE SIZES

Pumps with "C" or "ETA-14" in the model number have 1 1/4" outlet. Others have 1" outlet. Larger vertical drop pipe is not recommended because sand may accumulate due to low flow velocity. For sizing of long pipelines, consult a pipe sizing chart.

DIMENSIONS & WEIGHTS

PUMP & MOTOR

- Diameter: 3.78" (96mm) Height: 20"-32" (500-800mm) depending on model
- Weight: 25lbs (11.5kg) or less, depending on model

CONTROLLER

- 17" x 7" x 6" (425 x 175 x 150mm)
- PV input: 3/4" conduit hole
- Output: 1 1/4" conduit hole
- Float switch cable: 1/2" conduit hole
- Weight: 11lbs (4.8kg)
- Enclosure: anodized aluminum, gasket-sealed, weatherproof to tropical specifications (IEC 68-2-30)

SOLAR ARRAY: Size and weight can be estimated from the array watts. Watts is the last 3 digits of the system number.

- Approximate area in sq. feet = watts/10 (sq.m = watts/100).
- Approximate weight (including mounting rack) in lbs = watts x .3 (kg = watts x .14) Tracker option adds approximately 20% to the weight.

WETTED MATERIALS

stainless steel 304, 316, 440B, brass (check valve only, 2% Pb), NBR rubber, polyurethane cable jacket, POM bottom plate. Pumps without "C" in model number also contain chromium plated 316 stainless steel and natural rubber.

TEMPERATURE LIMITS (pumps without C in system #)

The optimum working range of water temperature is 45-77°F (7-25°C). As hot as 104°F (40°C) may stop the pump but will not cause damage. For other temperatures, inquire.

ACCESSORIES

- FLOAT SWITCH for full-tank shutoff, Item #10320
- FLOAT SWITCH CABLE (18 AWG, shielded, burial, UV for max. 2,000ft from pump controller to switch) Item #10326
- LOW WATER SENSOR CABLE (1-conductor, submersible) Item #11421

HOW TO SELECT AN

ETAPUMP INTEGRATED SYSTEM™

REFER TO THE SIZING TABLE

Daily volume is calculated for worst-case conditions. Your results may be better.

VERTICAL LIFT = total dynamic head = the vertical distance from the draw-down level in the water source, to the pipe outlet or top of storage tank + pipe friction losses.

CLIMATE ZONE Three solar radiation zones are shown on the table, defined by *peak sun hours/day*. 7.5 is average for summer in central and western USA, and for most locations during dry summer weather.

PERFORMANCE RELATED TO WEATHER These systems are selected for optimum daily output during clear, dry weather. For improved performance during cloudy weather, select a system that produces about 50% more water than you require at 4.5 peak sun hours, or ask your supplier for advice. For satisfactory winter performance, it may be necessary to adjust the solar array tilt. This is an easy adjustment to perform, twice per year.

SOLAR TRACKER OPTION A solar tracker automatically aims the solar array at the sun throughout the day. In clear weather, tracking increases the daily water volume by about 40% in summer (15% in winter). The tracker's drive is non-mechanical (passive) and highly reliable, using only the flow of fluid against gravity. Tracking requires "Tracker Option" to be ordered with the original purchase. For optimum performance during cloudy weather, or with frequent highly turbulent wind, a passive tracker is not recommended.

DOUBLE SYSTEM Two pump systems can be installed in the same water source if the well casing is not less than 6" inside diameter. This will double the daily water volume.

WARRANTY

4 YEARS for pump and controller when purchased as part of an ETAPUMP Integrated System™. Solar modules 20 or 25 YEARS, mounting racks and trackers 10 years – according to each manufacturer's warranty.

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Dankoff Solar Products, Inc.
Solar water pumping since 1983

AVAILABLE FROM

