

# PS1200 HR / C



## Solar Operated Submersible Pump System, 4" Helical Rotor (HR) or Centrifugal (C) Pump Unit

### Characteristics

- lift up to 240 m
- flow rate up to 11.0 m<sup>3</sup>/h
- simple installation
- maintenance-free
- high reliability and life expectancy
- cost-efficient pumping

### Application

- drinking water supply
- livestock watering
- pond management
- irrigation
- etc.

### Components

#### Controller PS1200

- controlling of the pump system and monitoring of the operating states
- mounted at surface (no submerged electronic parts)
- two control inputs for well probe (dry running protection), float or pressure switches, remote control etc.
- automatic reset 20 minutes after well probe turns pump off
- protected against reverse polarity, overload and high temperature
- speed control, max. pump speed adjustable to reduce flow rate to approx. 30 %
- solar operation: integrated MPPT (Maximum Power Point Tracking)
- battery operation: low voltage disconnect and restart after battery has recovered
- max. efficiency 92 % (motor + controller)
- enclosure: IP 54 (sealed, weatherproof)

#### Motor ECDRIVE 1200 HR / C

- brushless DC motor
- no electronics inside motor
- water filled
- IP68, pressure balanced, max. submersion unlimited
- dynamic slide bearings, material: carbon/ceramic
- wetted material: stainless steel (AISI 316), POM, rubber, cable drinking water approved

#### Pump End (PE)

- high life expectancy
- none-return valve
- dry running protection (optional)
- material: stainless steel (AISI 316), rubber

#### For HR Pumps Only

- helical rotor pump (positive displacement pump)
- two main parts only: stator and rotor, field servicable
- stator: geometry made of abrasion resistant rubber
- rotor: stainless steel, hard chrome plated, abrasion resistant
- more resistant to damage by sand than other pump types
- self-cleaning

### Performance

PS1200	HR-03	HR-03H	HR-04	HR-04H	HR-07
article #	1228-X	1230-X	1235-X	1240-X	1245-X
lift [m]	0-140	140-240	0-80	80-160	40-120
max. flow rate [m <sup>3</sup> /h]	0.5	0.5	0.8	0.8	1.2
max. efficiency [%]	60	64	60	65	64
<b>solar operation</b>	nominal voltage 72-96 V DC open circuit voltage max. 200 V DC				
solar generator [Wp]	350-480	420-900	350-420	420-1200	420-1200
<b>battery operation</b>	nominal voltage 72-96 V DC				

PS1200	HR-10	HR-14	HR-20	C-BF-04	C-DF-03
article #	1250-X	1255-X	1260-X	1220	1225
lift [m]	30-80	0-60	0-40	0-25	0-15
max. flow rate [m <sup>3</sup> /h]	1.9	2.7	3.6	7.3	11.0
max. efficiency [%]	64	65	64	40	40
<b>solar operation</b>	nominal voltage 72-96 V DC open circuit voltage max. 200 V DC				
solar generator [Wp]	420-1200	350-1200	480-1200	350-1200	840-1200
<b>battery operation</b>	nominal voltage 72-96 V DC				



PS1200 HR-04-H

### System Sizing Table

#### Instructions

- Lift:** Find the lift you require and read the column below it.
- Daily Volume:** Find the daily volume you require, at an irradiation of 4.5, 6.0, 7.5 kWh/m<sup>2</sup>/day. 7.5 is moderately dry summer weather.

For more water, look further down the column.

**3. Pipe Sizing:** Use peak flow rate for pipe sizing.

**4. Wire Size, Max. Wire Length**

Solar Array Peak Power	VERTICAL LIFT		5 m 16 ft		10 m 33 ft		15 m 50 ft		20 m 65 ft		30 m 100 ft		40 m 133 ft		50 m 165 ft		60 m 200 ft		70 m 230 ft		
	array mounting		fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	
<b>flow rate [m<sup>3</sup>/day]</b>																					
350 Wp	irradiation	7.5	42	61	22	30	23	29	18	26	14	20	6.8	8.7	6.1	8.3	5.7	7.9	4.9	6.8	
	kWh/	6.0	37	53	19	26	18	24	15	20	10	14	6.5	8.3	5.5	7.5	4.8	6.9	4.1	5.8	
	m <sup>2</sup> /day	4.5	32	44	16	22	14	19	10	14	6	8	6.0	8.0	4.7	6.2	4.0	5.6	3.5	4.8	
	pump type		C-BF-04				HR-14				HR-04										
	peak flow rate [l/min]		79				47				40				36						
wire size / max. length		4mm <sup>2</sup> / 60m, #12 / 200ft																			
420 Wp	irradiation	7.5	47	68	26	31	24	30	20	29	16	23	8.7	12.5	6.8	8.7	6.1	8.3	5.7	7.6	
	kWh/	6.0	41	59	22	27	19	25	17	24	12	17	7.5	10.6	6.0	7.9	5.4	7.2	4.8	6.4	
	m <sup>2</sup> /day	4.5	36	49	17	24	15	21	14	19	8	11	6.5	8.7	5.0	7.0	4.5	6.0	4.0	5.4	
	pump type		C-BF-04				HR-14				HR-07				HR-04						
	peak flow rate [l/min]		87				43				42				38						
wire size / max. length		4mm <sup>2</sup> / 60m, #12 / 150ft																			
480 Wp	irradiation	7.5	52	76	30	38	27	35	22	30	18	26	14.0	20.1	11.0	14.4	8.7	12.5	6.1	8.7	
	kWh/	6.0	46	65	24	32	22	29	19	27	15	19	10.0	14.0	8.5	12.0	7.0	10.0	5.5	7.4	
	m <sup>2</sup> /day	4.5	40	55	19	26	16	22	15	21	12	16	7.0	9.5	5.5	7.5	5.0	6.5	4.5	6.0	
	pump type		C-BF-04				HR-20				HR-14				HR-07						
	peak flow rate [l/min]		95				57				55				42						
wire size / max. length		4mm <sup>2</sup> / 60m, #12 / 150ft																			
660 Wp	irradiation	7.5	64	93	44	64	32	39	26	30	22	29	17.0	24.6	13.6	18.9	9.8	14.4	8.7	12.5	
	kWh/	6.0	56	79	36	51	27	34	23	29	18	24	13.5	19.0	10.7	14.5	8.5	12.0	7.3	10.5	
	m <sup>2</sup> /day	4.5	48	66	28	38	22	30	19	25	14	19	10.0	13.5	8.0	10.0	7.0	9.5	6.0	8.5	
	pump type		C-BF-04				HR-20				HR-14				HR-07						
	peak flow rate [l/min]		114				106				57				43						
wire size / max. length		4mm <sup>2</sup> / 60m, #12 / 150ft																			
720 Wp	irradiation	7.5	70	100	50	71	36	51	29	40	25	36	20	29	18	26	11	14	10	14	
	kWh/	6.0	62	88	43	59	28	40	26	36	22	30	18	25	14	19	10	14	9	13	
	m <sup>2</sup> /day	4.5	53	76	35	47	20	28	23	32	17	24	16	21	9	12	9	12	8	11	
	pump type		C-BF-04				HR-20				HR-14				HR-07						
	peak flow rate [l/min]		117				110				95				54						
wire size / max. length		4mm <sup>2</sup> / 60m, #10 / 250ft																			
840 Wp	irradiation	7.5	77	111	55	80	41	60	32	40	27	38	22	30	19	27	14	20	10	14	
	kWh/	6.0	70	100	49	70	36	51	30	40	25	35	21	28	16	23	12	17	10	14	
	m <sup>2</sup> /day	4.5	63	88	43	59	30	41	28	38	23	31	18	24	13	18	10	14	9	13	
	pump type		C-DF-03		C-BF-04		HR-20				HR-14				HR-10		HR-07				
	peak flow rate [l/min]		163		121		112				55				54		43				
wire size / max. length		4mm <sup>2</sup> / 60m, #10 / 250ft																			
1000 Wp	irradiation	7.5	85	125	72	105	48	70	42	60	31	40	25	36	21	29	17	25	14	20	
	kWh/	6.0	78	110	60	85	42	60	36	51	28	37	22	30	18	25	14	21	12	17	
	m <sup>2</sup> /day	4.5	71	96	47	65	36	49	30	41	25	33	18	24	15	20	12	16	10	14	
	pump type		C-DF-03		C-BF-04		HR-20				HR-14				HR-10						
	peak flow rate [l/min]		170		159		114				102				54						
wire size / max. length		4mm <sup>2</sup> / 60m, #10 / 250ft																			
1200 Wp	irradiation	7.5	95	132	79	125	53	76	47	66	33	40	26	38	22	30	18	26	15	21	
	kWh/	6.0	88	121	70	103	49	70	42	58	31	40	24	33	20	27	16	23	14	19	
	m <sup>2</sup> /day	4.5	80	107	59	80	45	62	36	49	28	38	21	28	18	24	14	19	12	16	
	pump type		C-DF-03		C-BF-04		HR-20				HR-14				HR-10						
	peak flow rate [l/min]		170		159		117				106				54						
wire size / max. length		4mm <sup>2</sup> / 60m, #10 / 250ft																			

#### System Voltage

72-96 V nominal, e.g. 6 to 8 standard 12 V modules wired in series, Voc 200 V max.

#### Lift Limits

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

#### Wire Sizes

**Cable Layout** is calculated to stay within 4 % power loss.

**Pump Cable**, example: 6 mm<sup>2</sup> / 130 m = maximum allowable length (controller to pump) for the given wire size.

#### Variations of Length

**Longer:** for each 50 % increase, the next larger wire size is required

**Shorter:** for each 33 % decrease, the next smaller wire size is required

**Array To Controller:** if shorter than 6 m / 20 ft: 4 mm<sup>2</sup> / #10 min.

**Controller To Low-Water Probe:** 1 mm<sup>2</sup> / #18 min. 2-conductor

Conversion For Flow

1 m<sup>3</sup> = 264 US Gal.  
 1 m<sup>3</sup> = 220 Imp. Gal.  
 1 l/min = 0.264 US Gal./min  
 1 l/min = 0.220 Imp. Gal./min

Conversion For Lift / Length

1 m = 3.3 ft

1 lift

80 m 265 ft		90 m 300 ft		100 m 330 ft		120 m 400 ft		140 m 460 ft		160 m 530 ft		180 m 600 ft		200 m 660 ft		230 m 760 ft		VERTICAL LIFT	Solar Array Peak Power
fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	fixed	tracked	array mounting	

flow rate [m<sup>3</sup>/day]

3.8	5.1	3.4	5.0	3.2	4.7	3.0	4.3	2.7	4.0
3.3	4.4	3.0	4.0	2.7	3.9	2.5	3.3	2.0	2.9
2.8	3.8	2.6	3.5	2.2	3.0	1.7	2.3	1.3	1.8
HR-03									
8.3		7.6		7.2		6.8		6.4	
4mm <sup>2</sup> / 140m, #10 / 500ft									

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

350 Wp

4.7	6.9	4.5	5.4	4.0	5.0	3.7	5.0	3.0	4.2	2.3	3.2	1.7	2.4
3.9	5.5	3.7	4.7	3.2	4.2	3.0	4.1	2.5	3.4	2.0	2.7	1.4	1.9
3.0	4.0	2.9	3.9	2.4	3.3	2.3	3.2	2.0	2.7	1.7	2.2	1.0	1.4
HR-04H		HR-03				HR-03H							
9.5		7.9		7.6		7.2		6.8		6.1		5.3	
#10 / 400ft		4mm <sup>2</sup> / 140m, #10 / 500ft				6mm <sup>2</sup> / 180m, #8 / 750ft							

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

420 Wp

5.7	8.2	5.5	8.0	5.0	7.0	4.5	6.5	3.3	4.5	2.8	4.0	2.3	3.0	1.9	2.7	1.6	2.3		
4.8	6.7	4.4	6.5	3.8	5.3	3.4	4.8	3.0	4.0	2.4	3.3	1.9	2.5	1.6	2.2	1.3	1.8		
3.9	5.2	3.3	4.5	2.6	3.5	2.2	3.0	2.6	3.5	1.9	2.5	1.5	2.0	1.2	1.6	1.0	1.3		
HR-04H				HR-03				HR-03H											
12.1				11.4				10.2		9.5		7.2		6.4		6.1		6.1	
4mm <sup>2</sup> / 110m, #10 / 450ft				#10 / 500ft				6mm <sup>2</sup> / 180m, #8 / 750ft		8mm <sup>2</sup> / 230m, #8 / 750ft									

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

480 Wp

8.0	11.5	6.5	8.8	5.5	7.8	5.1	7.4	4.5	6.4	3.3	4.6	3.2	4.3	3.0	4.1	2.1	3.7
6.5	9.2	5.5	7.4	4.9	6.7	4.0	5.8	3.5	5.0	3.0	4.2	2.8	3.7	2.5	3.3	1.8	2.8
5.0	7.0	4.5	6.0	4.3	5.5	3.0	4.2	2.5	3.5	2.7	3.7	2.4	3.2	2.0	2.5	1.5	2.0
HR-07		HR-04H				HR-03H											
18.9		12.9		12.5		12.1		11.7		6.8		6.8		6.8		6.8	
#10 / 300ft		6mm <sup>2</sup> / 170m, #10 / 450ft				6mm <sup>2</sup> / 180m, #8 / 750ft		8mm <sup>2</sup> / 230m, #8 / 750ft									

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

660 Wp

9.4	13.6	8.7	12.6	6.0	8.7	5.7	8.2	5.3	7.0	3.7	5.0	3.5	4.7	3.3	4.2	3.0	4.0
8.2	11.5	7.4	10.5	5.8	8.0	5.0	6.8	4.4	6.0	3.5	4.7	3.3	4.4	3.0	3.9	2.5	3.4
7.0	9.5	6.0	8.1	5.5	7.4	4.0	5.4	3.5	4.7	3.3	4.5	3.0	4.0	2.7	3.6	2.0	2.7
HR-07		HR-04H				HR-03H											
19.7		18.9		12.5		12.5		12.1		6.8		6.8		6.8		6.8	
4mm <sup>2</sup> / 100m, #10 / 350ft		6mm <sup>2</sup> / 170m, #10 / 500ft				6mm <sup>2</sup> / 180m, #8 / 750ft		8mm <sup>2</sup> / 230m, #8 / 750ft									

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

720 Wp

10.0	14.0	9.4	13.5	8.0	12.0	7.2	10.5	6.0	7.5	4.2	5.2	4.0	5.0	3.7	4.4	3.3	4.2
8.9	12.0	8.4	11.6	7.3	10.4	6.5	9.0	5.2	7.0	3.9	5.0	3.6	4.7	3.4	4.2	3.1	4.0
7.8	10.5	7.3	9.8	6.5	8.8	5.5	7.4	4.4	6.0	3.5	4.7	3.2	4.3	3.0	4.1	2.8	3.8
HR-07		HR-04H				HR-03H											
19.7		18.9		18.2		17.4		12.1		6.8		6.8		6.8		6.8	
4mm <sup>2</sup> / 100m, #10 / 400ft		6mm <sup>2</sup> / 130m, #10 / 400ft				6mm <sup>2</sup> / 180m, #8 / 750ft		8mm <sup>2</sup> / 230m, #8 / 750ft									

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

840 Wp

13.0	18.0	10.0	13.5	9.0	12.5	8.5	12.0	6.5	8.0
11.0	15.0	9.0	12.3	8.0	11.0	7.6	10.5	5.8	7.4
9.0	11.7	8.0	11.0	7.0	9.5	6.7	9.0	5.0	6.8
HR-10		HR-07				HR-04H			
29.1		18.9		18.2		17.4		12.1	
#10 / 300ft		6mm <sup>2</sup> / 130m, #10 max. 400ft				#10 / 500ft			

2 daily volume

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

1000 Wp

14.0	20.0	11.0	13.5	10.0	12.5	9.5	12.0	7.00	8.71
13.0	17.4	10.0	13.0	9.0	11.8	8.5	11.0	6.40	8.52
11.0	14.8	9.2	12.4	8.0	11.0	7.5	10.0	5.72	7.68
HR-10		HR-07				HR-04H			
29.1		18.9		18.2		17.4		12.1	
#10 / 300ft		6mm <sup>2</sup> / 130m, #10 max. 400ft				#10 / 500ft			

3 peak flow for pipe sizing

irradiation	7.5
kWh/	6.0
m <sup>2</sup> /day	4.5
pump type	
peak flow rate [l/min]	
wire size / max. length	

1200 Wp

How Daily Water Volume Is Calculated

Daily volume is calculated by integrating real flow versus realistic solar (PV) output through the day.

Calculations include a 10 % PV output degradation (heat, dirt etc.). Cable losses are included at maximum allowable length. The solar array is fixed at tilt angle = latitude of the location.

irradiation:

kWh/m<sup>2</sup>/day = peak sun hours/day

Flow rates may vary +/- 10 %.

4 wire Size, max. wire length

Conversion For Wire Sizes

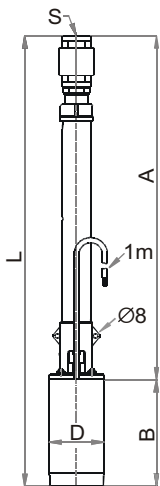
AWG	mm <sup>2</sup>
# 18	1
# 12	4
# 10	6
# 8	10
# 6	16

Table shows nearest larger metric cross section.

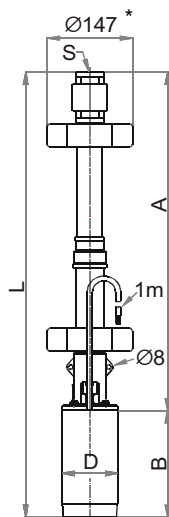
### Technical Data, Dimensions And Weights

Pump Unit (PU) (motor + pump end)	Dimensions					Shipping Dimensions			
	L [mm]	A [mm]	B [mm]	D [mm]	S	packaging [mm]	shipping volume [m³]	net weight [kg]	gross weight [kg]
HR-03, HR-03H, HR-04, HR-04H	780	595	185	96	G1½"	850x160x150	0.0204	11.2	12.0
HR-07, HR-10, HR-14, HR-20	771	586	185	96	G1½"	850x160x150	0.0204	11.5	12.3
C-BF-04	565	380	185	96	G1½"	660x160x150	0.0158	10.0	10.5
C-DF-03					G2"				
Controller Type									
PS1200						450x250x240	0.0270	4.5	5.3

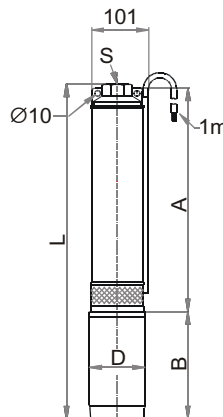
\* By cutting the rubber spacers, diameter can be adjusted from 147 mm (6") to 100 mm (4").



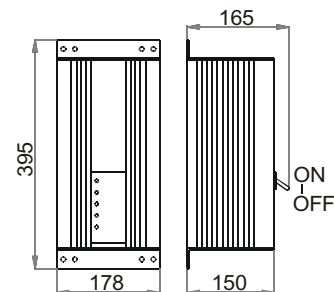
Pump Units  
HR-03, HR-03H,  
HR-04, HR-04H



Pump Units  
HR-07, HR-10,  
HR-14, HR-20



Pump Units  
C-BF-04,  
C-DF-03



Controller PS1200

#### Sand And Silt Tolerance

The pump (HR) has a higher resistance to wear from sand, clay etc. than any other pump type. In properly constructed wells the amount of sand, clay etc. is within the tolerance of the pump.

A concentration of solids greater than 2 % (by volume) may cause blockage in the pump or the drop pipe, especially at low flow rates.

Do not use the pump to clean out a dirty well.

#### Pump Cable And Splice

Standard submersible cable, 3-wire + ground (total four wires). Connection to the pump is made using industry-standard splicing methods.

#### Drop Pipe

G1½" (optionally 1" NPT) pump outlet. If water is dirty, consider a smaller size drop pipe to increase the flow velocity. This helps exhaust solid particles and prevent accumulation in the pipe. When considering reduced pipe size, consult a pipe sizing (friction loss) chart. Pipe can be of any standard material, rigid or flexible. A torque arrestor is *not* required.

#### Temperature Limits

Pump end, motor: water temperature up to +40° C (+104° F).

Specify temperature range on order.

Controller: ambient temperature -30° C to +55° C (-22° F to +131° F).

#### Warranty

Two years manufacturer's warranty against defects in material and workmanship.