

DISPLAY THIS CARD ON PRINCIPAL FRONTAGE OF WORK



CITY OF PORTLAND BUILDING PERMIT

This is to certify that JESSICA A RUSSELL

Located At 363 DEERING AVE

Job ID: 2012-02-3318-SF

CBL: 118- E-011-001

has permission to Solar Panels

provided that the person or persons, firm or corporation accepting this permit shall comply with all of the provisions of the Statues of Maine and of the Ordinances of the City of Portland regulating the construction, maintenance and use of the buildings and structures, and of the application on file in the department.

Notification of inspection and written permission procured before this building or part thereof is lathed or otherwise closed-in. 48 HOUR NOTICE IS REQUIRED.

A final inspection must be completed by owner before this building or part thereof is occupied. If a certificate of occupancy is required, it must be

Fire Prevention Officer

Code Enforcement Officer / Plan Reviewer

**THIS CARD MUST BE POSTED ON THE STREET SIDE OF THE PROPERTY
PENALTY FOR REMOVING THIS CARD**



PORTLAND MAINE

Strengthening a Remarkable City, Building a Community for Life • www.portlandmaine.gov

Director of Planning and Urban Development
Jeff Levine

Job ID: 2012-02-3318-SF

Located At: 363 DEERING AVE

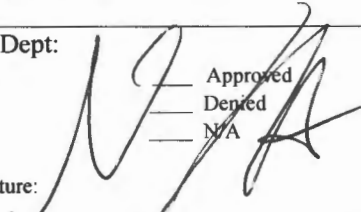
CBL: 118- E-011-001

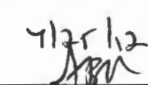

Conditions of Approval:

Separate permits are required for electrical, plumbing, and HVAC work.

City of Portland, Maine - Building or Use Permit Application

389 Congress Street, 04101 Tel: (207) 874-8703, FAX: (207) 8716

Job No: 2012-02-3318-SF 2012-46073-amend	Date Applied: 7/16/2012	CBL: 118- E-011-001	
Location of Construction: 363 DEERING AVE	Owner Name: JESSICA A RUSSELL	Owner Address: 25 MOTLEY ST PORTLAND, ME 04102	Phone:
Business Name:	Contractor Name: Revision Energy	Contractor Address: 142 Presumpscot St., Portland, ME 04103	Phone: (207) 221-6342
Lessee/Buyer's Name:	Phone:	Permit Type: BLDG - Building	Zone: R-5
Past Use: New single family	Proposed Use: Same – single family – install solar hot water and electrical panels on roof	Cost of Work: 500000.00 25,000.00	CEO District:
		Fire Dept: <input checked="" type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> N/A	Inspection: Use Group: R-3 Type: HVAC
Proposed Project Description: Install solar panels on roof		Signature:  Pedestrian Activities District (P.A.D.)	
Permit Taken By: Lannie		Zoning Approval	

	Special Zone or Reviews	Zoning Appeal	Historic Preservation
1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules. 2. Building Permits do not include plumbing, septic or electrical work. 3. Building permits are void if work is not started within six (6) months of the date of issuance. False informatin may invalidate a building permit and stop all work.	<input type="checkbox"/> Shoreland <input type="checkbox"/> Wetlands <input type="checkbox"/> Flood Zone <input type="checkbox"/> Subdivision <input type="checkbox"/> Site Plan <input type="checkbox"/> Maj <input type="checkbox"/> Min <input type="checkbox"/> MM Date: 07 17 12 	<input type="checkbox"/> Variance <input type="checkbox"/> Miscellaneous <input type="checkbox"/> Conditional Use <input type="checkbox"/> Interpretation <input type="checkbox"/> Approved <input type="checkbox"/> Denied Date:	<input checked="" type="checkbox"/> Not in Dist or Landmark <input type="checkbox"/> Does not Require Review <input type="checkbox"/> Requires Review <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/Conditions <input type="checkbox"/> Denied Date: ARU 

CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the appication is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT ADDRESS DATE PHONE

RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE DATE PHONE



original - 2012-02-23 18.

Child 2012-4-6073

General Building Permit Application

If you or the property owner owes real estate or personal property taxes or user charges on any property within the City, payment arrangements must be made before permits of any kind are accepted.

Location/Address of Construction: <u>363 Deering Ave</u>		
Total Square Footage of Proposed Structure/Area	Square Footage of Lot	Number of Stories
Tax Assessor's Chart, Block & Lot Chart# Block# Lot# <u>118</u> <u>E</u> <u>11</u>	Applicant * must be owner, Lessee or Buyer * Name <u>Revision Energy</u> Address <u>142 Presumpscot St</u> City, State & Zip <u>Portland, ME 04103</u>	Telephone: <u>221-6342</u>
Lessee/DBA (If Applicable)	Owner (if different from Applicant) Name <u>Jessica Russell</u> Address <u>363 Deering Ave</u> City, State & Zip <u>Portland, ME</u>	Cost Of Work: <u>\$25000</u> C of O Fee: \$ _____ Total Fee: \$ _____
Current legal use (i.e. single family) _____ Number of Residential Units _____ If vacant, what was the previous use? _____ Proposed Specific use: _____ Is property part of a subdivision? _____ If yes, please name _____ Project description: <u>Residence - solar hot water panels & electric panels on roof</u>		
Contractor's name: <u>Revision Energy</u> Address: <u>142 Presumpscot St</u> City, State & Zip <u>Portland ME 04103</u> Telephone: _____ Who should we contact when the permit is ready: <u>Jer Hatch</u> Telephone: <u>221-6342</u> Mailing address: <u>above</u>		

Please submit all of the information outlined on the applicable Checklist. Failure to do so will result in the automatic denial of your permit.

In order to be sure the City fully understands the full scope of the project, the Planning and Development Department may request additional information prior to the issuance of a permit. For further information or to download copies of this form and other applications visit the Inspections Division on-line at www.portlandmaine.gov, or stop by the Inspections Division office, room 315 City Hall or call 874-8703.

I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that I have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in this application is issued, I certify that the Code Official's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.

Signature: J Hatch Date: 2/12/2012

This is not a permit; you may not commence ANY work until the permit is issued

RECEIVED
2012 FEB 23 10:15 AM
Dept. of Building Inspections
City of Portland, Maine



Professional design, installation and service of renewable energy systems

July 12, 2012

City of Portland
389 Congress Street
Portland, ME 04101

RE: ReVision Energy Solar Installation at 363 Deering Avenue

Dear Code Enforcement,

ReVision Energy has been contracted to design and install a solar electric (PV) system, solar hot water system and air source heat pump at the above address in Portland. This letter is to confirm that all work will be performed by licensed and qualified installers, expert in the field and in compliance with both manufacturer's recommendations and all applicable local and state codes and standards. This also confirms that the roof structure can handle the weight of the panel load, in addition to snow load. The weight of the panels does not change the structural integrity of the building.

ReVision Energy employs licensed engineers, plumbers, and electricians and carries the solar industries highest certifications (NABCEP) in both solar thermal and photovoltaic installation. We're committed to high quality, code compliant work and look forward to working together with the city and the CEO to ensure that all your requirements and needs are met and that our customer ends up with a system that is beautiful, functional and safe.

Electrical and grounding:

All electrical work to be performed by a licensed ME electrician and will conform to NEC 2011 revision as well as NABCEP standards. Specifically, wiring and grounding of the photovoltaic system will be governed by manufacturer's recommendations and article 690. All installed metal components are grounded via the grounding electrode conductor.

If you have any questions or concerns, we'd like to address them as quickly and completely as possible. Please don't hesitate to call or e mail anytime.

Respectfully,

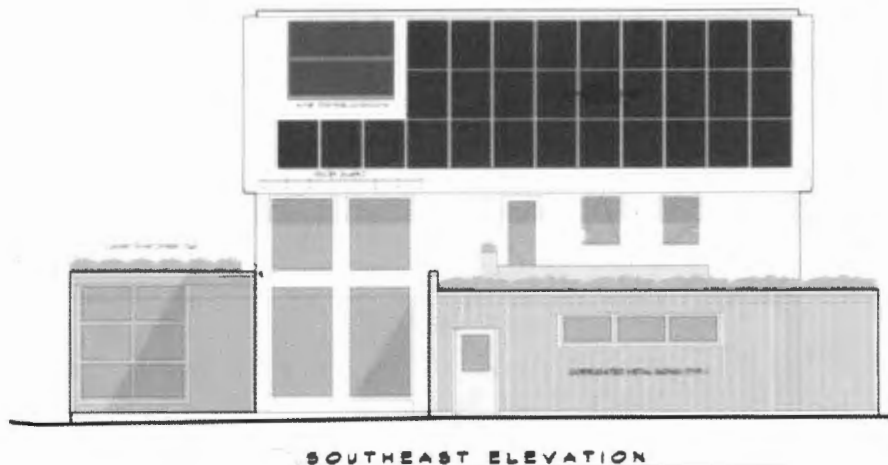
Fortunat Mueller, P.E.
Co-owner
ReVision Energy
(207) 752-6358
fortunat@revisionenergy.com

Bangor
207-570-4222

Liberty
207-589-4171

Portland
207-221-6342

Portsmouth
603-486-7170



ARRAY ORIENTATION:
135° (True)

ARRAY PITCH:
45° angle

Collectors to be mounted as shown in elevation drawing

Project Summary

System	Performance	Cost	Incentives	Net Cost
Grid-tied photovoltaic array with CSI modules and SMA string inverter	<ul style="list-style-type: none"> Produce roughly 8,830 kWhrs of clean, renewable energy annually. Offset roughly 11,479 lbs. of CO2 emissions annually. 	\$24,704 Installed	-(\$7,411) 30% Federal Tax Credit -(\$2,000) Rebate from Efficiency Maine	\$15,292

Economic & Environmental Return on Investment

This solar energy system uses a clean, renewable 'fuel' called sunshine. Because it displaces finite, polluting and increasingly expensive fossil fuel, the solar energy system is guaranteed to pay for itself through avoided costs. After you get all of your initial solar investment back, the system will continue to deliver a valuable household revenue stream for years to come. Every time energy costs go up, your financial return on investment improves proportionally.

Plus, the system will be eliminating thousands of pounds of CO2 emissions each year, delivering a powerful environmental benefit for you, your community and future generations. ReVision Energy's experienced team of certified solar professionals delivers the peace of mind that comes from knowing you have the most robust, reliable solar energy system available in northern New England.



Major System Components

Based on a professional evaluation of your available roofspace, site configuration, and energy demand, ReVision Energy proposes a roof-mounted photovoltaic array of 7.20 kilowatts (nominal).

The system features these major components:

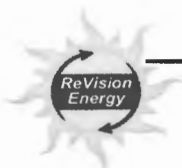
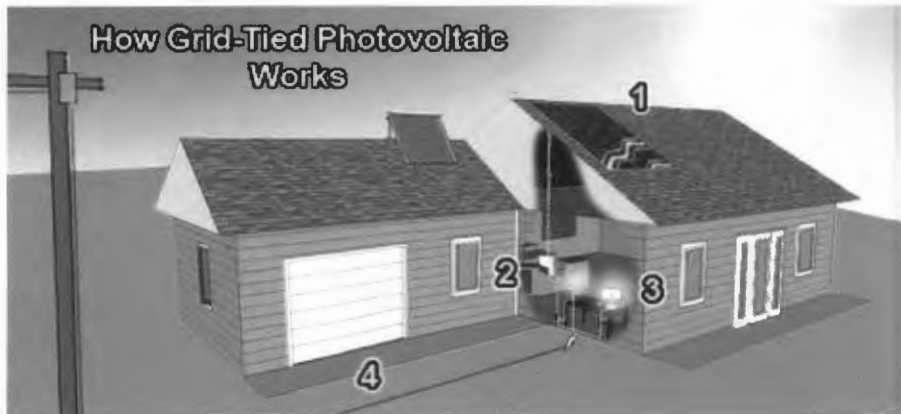
- (30) 240 watt Monosilicon Canadian Solar photovoltaic panels; CS6P-240M or equivalent (www.canadian-solar.com)
- (1) SMA Sunny Boy 7000 US grid-tied solar electric inverter (www.sma-america.com)
- (200) Feet of Iron Ridge extruded aluminum solar mounting rail with hardware
- (1) Flashed Metallic Junction Box

System Operation

Whenever sun shines on the solar electric panels, they will generate direct current (DC) electricity. That DC electricity is transmitted to an inverter, which then converts it into AC electricity which can be used in your home. Any electric loads (TV, dryer, electronics, etc.) operating while the sun is shining will use available solar electricity. Any excess will flow out to the grid and you will receive a credit for the production.

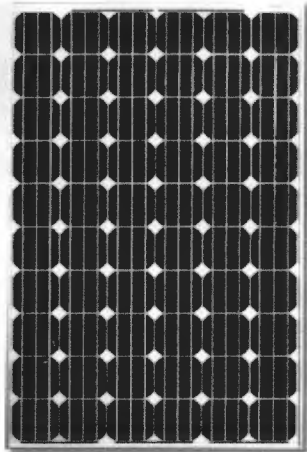
Whenever the sun is not out, you will continue to purchase grid electricity as you do now. The local utility company will install record electricity you feed into the grid. If at the end of the month your generation is greater than your consumption, you will earn a credit on your next bill. You can bank your surplus from month to month for up to a year.

System Diagram



CS6P

230/235/240/245/250M

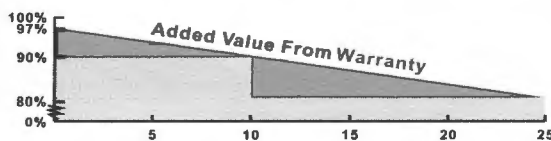


On-grid Module

CS6P is a robust solar module with 60 solar cells. These modules can be used for on-grid solar applications. Our meticulous design and production techniques ensure a high-yield, long-term performance for every module produced. Our rigorous quality control and in-house testing facilities guarantee Canadian Solar's modules meet the highest quality standards possible.

Key Features

- Industry first comprehensive warranty insurance by AM Best rated leading insurance companies in the world
- Industry leading plus only power tolerance: 0 ~ +5W
- Strong framed module, passing mechanical load test of 5400Pa to withstand heavier snow load
- The 1st manufacturer in the PV industry certified for ISO:TS16949 (The automotive quality management system) in module production since 2003
- ISO17025 qualified manufacturer owned testing lab, fully complying to IEC, TUV, UL testing standards
- **Backed By Our New 10/25 Linear Power Warranty Plus our added 25 year insurance coverage**



- 10 year product warranty on materials and workmanship
- 25 year linear power output warranty

Applications

- On-grid residential roof-tops
- On-grid commercial/industrial roof-tops
- Solar power stations
- Other on-grid applications

Quality Certificates

- IEC 61215, IEC 61730, UL 1703, CEC Listed, MCS, CE
- ISO9001: 2008: Standards for quality management systems
- ISO/TS16949:2009: The automotive quality management system

Environmental Certificates

- ISO14001:2004: Standards for Environmental management systems
- QC080000 HSPM: The Certification for Hazardous Substances Regulations
- Reach Compliance





SUNNY BOY 5000US / 6000US / 7000US / 8000US



SB 8000US AVAILABLE IN 2010

- Highest CEC efficiency in its class
- Integrated load-break rated lockable DC disconnect switch
- Integrated fused series string combiner

- Sealed electronics enclosure & Opticool™
- Comprehensive SMA communications and data collection options

- Ideal for residential or commercial applications
- Sunny Tower compatible
- 10 year standard warranty
- UL 1741/IEEE-1547 compliant



SUNNY BOY 5000US / 6000US / 7000US / 8000US

The best in their class

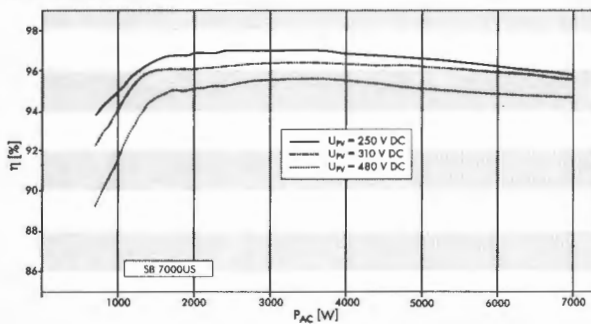
Our US series inverters utilize our proven technology and are designed specifically to meet IEEE-1547 requirements. Sunny Boy 6000US, Sunny Boy 7000US and Sunny Boy 8000US are also compatible with the Sunny Tower. Increased efficiency means better performance and shorter payback periods. All four models are field-configurable for positive ground systems making them more versatile than ever. Throughout the world, Sunny Boy is the benchmark for PV inverter performance and reliability.

Technical Data

	SB 5000US	SB 6000US	SB 7000US	SB 8000US
Recommended Maximum PV Power (Module STC)	6250 W	7500 W	8750 W	10000 W
DC Maximum Voltage	600 V	600 V	600 V	600 V
Peak Power Tracking Voltage	250-480 V	250-480 V	250-480 V	300-480 V
DC Maximum Input Current	21 A	25 A	30 A	30 A
Number of Fused String Inputs	3 (inverter), 4 x 20 A (DC disconnect)	3 (inverter), 4 x 20 A (DC disconnect)	3 (inverter), 4 x 20 A (DC disconnect)	3 (inverter), 4 x 20 A (DC disconnect)
PV Start Voltage	300 V	300 V	300 V	365 V
AC Nominal Power	5000 W	6000 W	7000 W	8000 W
AC Maximum Output Power	5000 W	6000 W	7000 W	8000 W
AC Maximum Output Current (@ 208, 240, 277 V)	24 A, 21 A, 18 A	29 A, 25 A, 22 A	34 A, 29 A, 25 A	N/A, 32 A, 29 A
AC Nominal Voltage Range	183 - 229 V @ 208 V 211 - 264 V @ 240 V 244 - 305 V @ 277 V	183 - 229 V @ 208 V 211 - 264 V @ 240 V 244 - 305 V @ 277 V	183 - 229 V @ 208 V 211 - 264 V @ 240 V 244 - 305 V @ 277 V	N/A @ 208 V 211 - 264 V @ 240 V 244 - 305 V @ 277 V
AC Frequency: nominal / range	60 Hz / 59.3 - 60.5 Hz	60 Hz / 59.3 - 60.5 Hz	60 Hz / 59.3 - 60.5 Hz	60 Hz / 59.3 - 60.5 Hz
Power Factor (Nominal)	0.99	0.99	0.99	0.99
Peak Inverter Efficiency	96.8%	97.0%	97.1%	96.5%
CEC Weighted Efficiency	95.5% @ 208 V 95.5% @ 240 V 95.5% @ 277 V	95.5% @ 208 V 95.5% @ 240 V 96.0% @ 277 V	95.5% @ 208 V 96.0% @ 240 V 96.0% @ 277 V	N/A @ 208 V 96.0% @ 240 V 96.0% @ 277 V
Dimensions: W x H x D in inches	18.4 x 24.1 x 9.5	18.4 x 24.1 x 9.5	18.4 x 24.1 x 9.5	18.4 x 24.1 x 9.5
Weight / Shipping Weight	141 lbs / 148 lbs	141 lbs / 148 lbs	141 lbs / 148 lbs	148 lbs / 152 lbs
Ambient Temperature Range	-13 to 113 °F	-13 to 113 °F	-13 to 113 °F	-13 to 113 °F
Power consumption at night	0.1 W	0.1 W	0.1 W	0.1 W
Topology	Low frequency transformer, true sinewave	Low frequency transformer, true sinewave	Low frequency transformer, true sinewave	Low frequency transformer, true sinewave
Cooling Concept	OptiCool™, forced active cooling	OptiCool™, forced active cooling	OptiCool™, forced active cooling	OptiCool™, forced active cooling
Mounting Location: indoor / outdoor (NEMA 3R)	●/●	●/●	●/●	●/●
LCD Display	●	●	●	●
Communication: RS485 / wireless	○/○	○/○	○/○	○/○
Warranty: 10 years / 15 years / 20 years	●/○/○	●/○/○	●/○/○	●/○/○
Compliance: IEEE-929, IEEE-1547, UL 1741, UL 1998, FCC Part 15 A & B	●	●	●	●
Specifications for nominal conditions		● Included ○ Optional		

NOTE: US inverters ship with gray lids.

Efficiency Curves



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 Toll Free +1 888 4 SMA USA
 www.SMA-America.com

SMA America, LLC

IRONRIDGE XR ROOF MOUNT PLATFORM

KEY FEATURES

- ◆ Extruded aluminum components are lightweight for easy handling yet strong enough for most roof mount applications
- ◆ Choice of XRL (lightweight) and XRS (standard) rails
- ◆ Both XRL and XRS rails come with slots for attaching L-feet and top slots for attaching panel clamps
- ◆ XRS rails has slot for bottom mounting clamps
- ◆ Hidden internal splice bars are aesthetically pleasing
- ◆ Internal splices provide superior strength and flexibility with L-feet placement
- ◆ Adjustable L-feet have vertical extension slots for easy adjustability of up to 1-3/8"
- ◆ Standoffs provide increased airflow and ventilation and enable precise placement of flashings
- ◆ Standoffs come in four standard heights: 3", 4", 6", and 7"
- ◆ XR platform compatible with popular flashings including QuickMount and Oatey
- ◆ Panel clamps for both top and bottom mounting
- ◆ Panel clamps for most popular photovoltaic modules
- ◆ Mid-clamp design maximizes panel density
- ◆ Ground clips eliminate the need for copper wire between modules
- ◆ The XR Roof Mount components are covered with an industry-leading 10 year limited product warranty and a 5 year limited finish warranty
- ◆ All XR Roof Mount components are PE certified



The IronRidge XR platform is a reliable, comprehensive, and feature rich photovoltaic mounting solution. Anchored by the XRS (Standard) and XRL (Light) rails, the XR platform includes all of the components necessary for supporting virtually any commercial or residential roof mount installation, regardless of surface material or roof grade.

The XRS and XRL rails are manufactured from extruded aluminum to maximize spans while minimizing weight for improved handling. The graceful curves of the XRS rail will please even the most aesthetically demanding customers. Rails can be extended with the IronRidge patent-pending internal splice bars, providing a strong support connection and ultimate flexibility in footing attachment locations. Installers have a variety of options in attaching IronRidge rails to the roof, including adjustable L-feet, aluminum standoffs, and tilt legs for optimizing power. In addition, IronRidge accommodates modules from most major manufacturers. Top-down panel clamps securely grip the outside frame of the module, freeing the installer from the constraints of panel mounting holes. The XRS rail has an additional side slot to enable the option of bottom mounting. Lastly, grounding clips pierce the anodized rails, creating a ground path through the equipment and eliminating the need to run copper wire between every module.

IronRidge provides a complete technical support system that includes step-by-step installation guides, engineering certification documentation, easy-to-read span charts, and on-line configurator software.

See reverse for product specifications and ordering information. Please contact your local distributor for configuration assistance.

SPECIFICATIONS

- ◆ XRL/XRS Rail – 6105-T5 extruded anodized aluminum
- ◆ XRL/XRS Splice Bars – 6105-T5 extruded aluminum
- ◆ Standoffs – 6105-T5 extruded aluminum
- ◆ L-feet: 6105-T5 extruded aluminum
- ◆ Clamps: 5052-H32 aluminum
- ◆ Hardware: 18-8 Stainless Steel

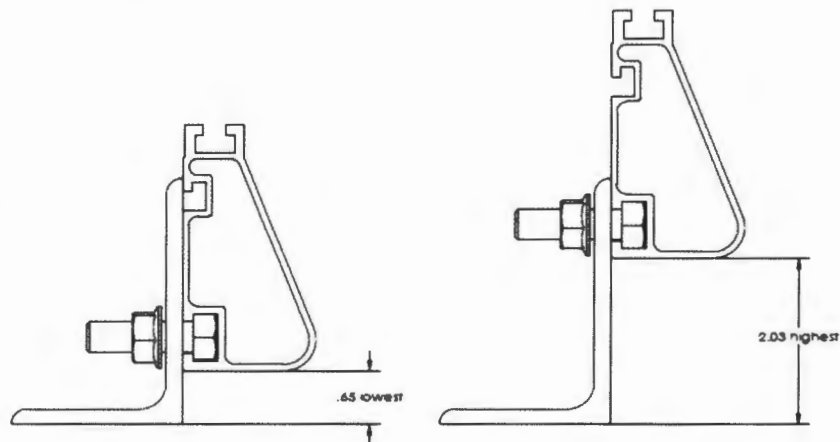
XRS PROPERTIES

- ◆ Area = .807136 inches²
- ◆ Centroid relative to output coordinate system origin
 - ◆ X = 0.5556
 - ◆ Y = 1.4097
 - ◆ Z = 120.000
- ◆ Moments of Inertia of the area (at the centroid)
 - ◆ I_{xx} = 0.8430
 - ◆ I_{xy} = 0.1117
 - ◆ I_{xz} = 0.0000
 - ◆ I_{yx} = 0.1117
 - ◆ I_{yy} = 0.1822
 - ◆ I_{yz} = 0.0000
 - ◆ I_{zx} = 0.0000
 - ◆ I_{zy} = 0.0000
 - ◆ I_{zz} = 1.0252
- ◆ Polar Moment of Inertia
 - ◆ At Centroid = 1.0252⁴
- ◆ Principal Moments of Inertia
 - ◆ I_x = 0.1638
 - ◆ I_y = 0.8614
- ◆ Principal-Axis
 - ◆ Angle = 99.343 degrees
- ◆ Moments of Inertia (output)
 - ◆ L_{XX} = 11625.205
 - ◆ L_{XY} = 0.5204
 - ◆ L_{XZ} = 53.8153
 - ◆ L_{YX} = 0.5204
 - ◆ L_{YY} = 11623.1909
 - ◆ L_{YZ} = 136.5369
 - ◆ L_{ZX} = 53.8153
 - ◆ L_{ZY} = 136.5369
 - ◆ L_{ZZ} = 2.8784

ORDERING INFORMATION

XR Rails		
Part Number	Description	Weight
51-7000-144a	XRS Standard Rail (1) – 12 feet	11.364 lbs
51-7000-168a	XRS Standard Rail (1) – 14 feet	13.258 lbs
51-7000-192a	XRS Standard Rail (1) – 16 feet	15.152 lbs
51-7000-216a	XRS Standard Rail (1) – 18 feet	17.046 lbs
51-6000-144a	XRL Light Rail (1) – 12 feet	6.288 lbs
51-6000-168a	XRL Light Rail (1) – 14 feet	7.336 lbs
51-6000-192a	XRL Light Rail (1) – 16 feet	8.384 lbs
51-6000-216a	XRL Light Rail (1) – 18 feet	9.432 lbs
29-7000-010	XRS Splice Kit (1)	0.442 lbs
29-7000-000	XRL Splice Kit (1)	0.151 lbs
Panel Clamps		
Part Number	Description	Weight
29-7000-xxx	End Clamps (4) – depends on panel	.251-.290 lbs
29-7000-10x	Mid Clamps (4) – depends on panel	.213-.251 lbs
29-7000-117	Under Clamps (4)	0.324 lbs
Footing Attachments & Flashings		
Part Number	Description	Weight
29-7000-017	L-foot Kit (4)	0.872 lbs
51-600x-500	3"-7" Standoffs – Specify L-foot or Tilt leg	.533-.710 lbs
31-1000-001	Oatey Galvanized Flashing 11830 (12)	8.750 lbs
31-1000-000	QuickMount QMSCA12 (12)	13.390 lbs
51-7200-0XX	Tilt Legs (7" – 40')	.0658 lbs/inch
51-7210-000	Tilt Leg Bracket	1.576 lbs
Grounding		
Part Number	Description	Weight
29-4000-001	WEEB DMC-Clip (100)	0.258 lbs
29-4000-002	WEEB Grounding Lug (100)	12.356 lbs
29-4000-003	WEEB Bonding Jumper (100)	17.614 lbs
29-4000-006	WEEB ACC-PV Wire Clip (100)	0.625 lbs

L-FOOT DIMENSIONS



SolarCon solar water heater tank

series NAS200



Meets and exceeds CSA C309 requirements

Function

The solar water heater has either one or two internal coils and a backup electric heating element in the single coil units. A heating medium is passed through the solar panels and internal coil as long as there is an adequate temperature difference between the heating medium and stored water in the tank. The internal coil is located as close to the bottom to facilitate the transfer of heat even at lower solar panel temperatures.

During periods of water flow through the water heater, hot water is drawn from the top of the heater and cold water comes into the bottom of the tank (by a dip tube or bottom inlet). On single coil tanks, if the hot water demand should exceed the solar heat input or there is an insufficient temperature difference between the heating medium and stored water, the heating element thermostat will activate the electrical heating element for backup heat. On double coil tanks, the upper tank is connected to the boiler for backup heat.

Solar heat output from the internal coil will vary depending on outside conditions and the temperature of the stored water.

Product range

NAS20053	Storage tank with lower coil and back up electric element	50 gallon
NAS20083	Storage tank with lower coil and back up electric element	80 gallon
NAS20123	Storage tank with lower coil and back up electric element	119 gallon
NAS20082	Storage tank with lower coil and top coil for boiler back up	80 gallon
NAS20122	Storage tank with lower coil and top coil for boiler back up	119 gallon
NAS20124	Storage tank with lower coil and top coil heat exchanger with back up electric element	119 gallon

Technical specifications

Tank materials:	porcelain coated steel	Connections:	3/4" NPT (50 gal.), 1" NPT (80, 119 gal.)
Tank insulation:	2" non-CFC foam	Maximum working pressure:	150 psi
Tank external cover:	powder-coated steel (20-24 ga.)	Testing pressure:	300 psi
Insulation thermal conductivity:	R16	Temperature and pressure relief valve:	210°F/150 psi max
Anode rods:	2 each magnesium	Maximum tank temperature:	180°F
Internal heat exchanger coil (lower):	1-1/2" x 30' (50 gallon)	Recommended maximum delivery hot water temperature:	120°F
	1-1/2" x 36' (80, 119 gallon)	Power requirements (electric element):	240 VAC
Internal heat exchanger coil (top):	1-1/2" x 24' (80, 119 gallon)	Power consumption (electric element):	4.5 KW
		Agency approval:	UL listed

Capacity and performance

Model	Actual Tank Volume (gal)	Coil Volume Solar/Boiler (gal)	Coil Surface Area Solar/Boiler (ft ²)	Coil Friction Loss* Solar/Boiler (ft. of head)	First Hour Rating (gal)	Recovery Rate Solar & Backup [#] (gal/hr)	Standby Loss Rating (°F/hr)
NAS20053	45	2.30/ -	11.78/ -	0.50/ -	91	51	1.1
NAS20083	75	2.76/ -	14.14/ -	0.60/ -	126	56	0.8
NAS20123	110	2.76/ -	14.14/ -	0.60/ -	158	56	1.2
NAS20082	73	2.76/1.84	14.14/9.42	0.60/0.40	226	158	0.8
NAS20122	108	2.76/1.84	14.14/9.42	0.60/0.40	258	158	1.2
NAS20124	108	2.76/1.84	14.14/9.42	0.60/0.40	282	182	1.2

NOTES: * Based on 5 GPM flow rate.
[#] Based on solar input of 140°F @ 2 GPM. Depending on model, backup heat recovery is calculated with either a 4500W heating element or a boiler with output of 180°F at 14 GPM. Potable water temperature rise is 77°F.

Dimensions

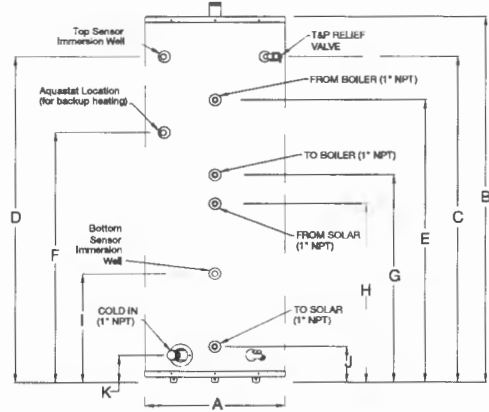
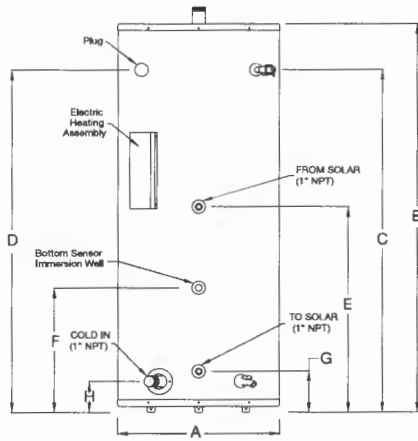
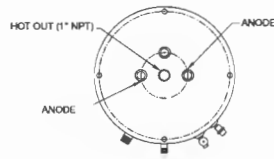
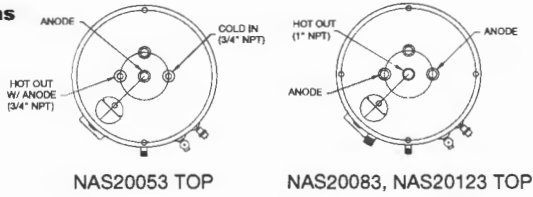
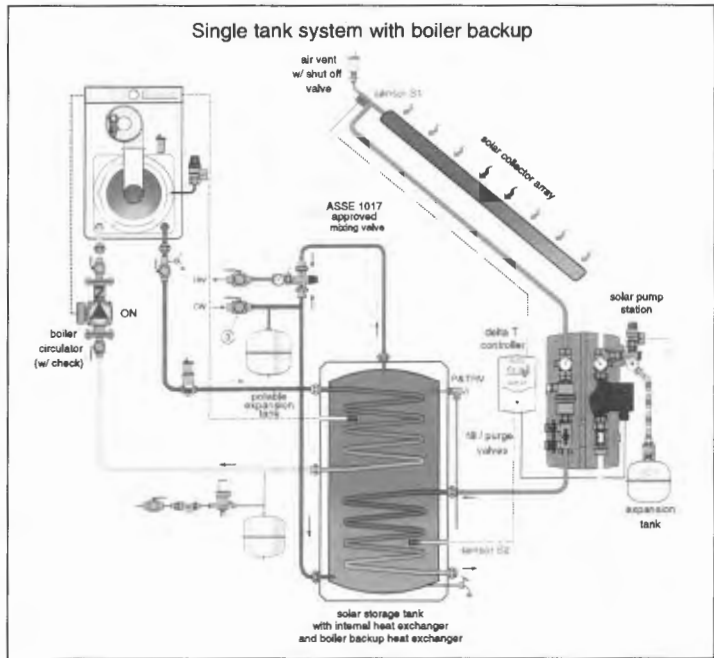
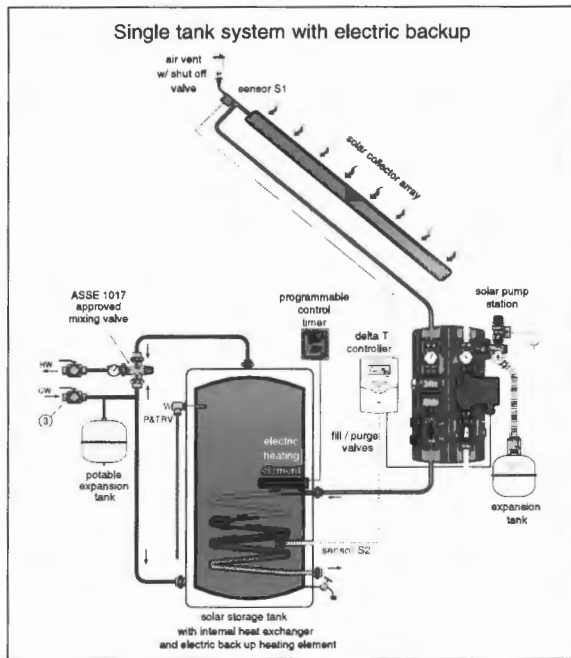


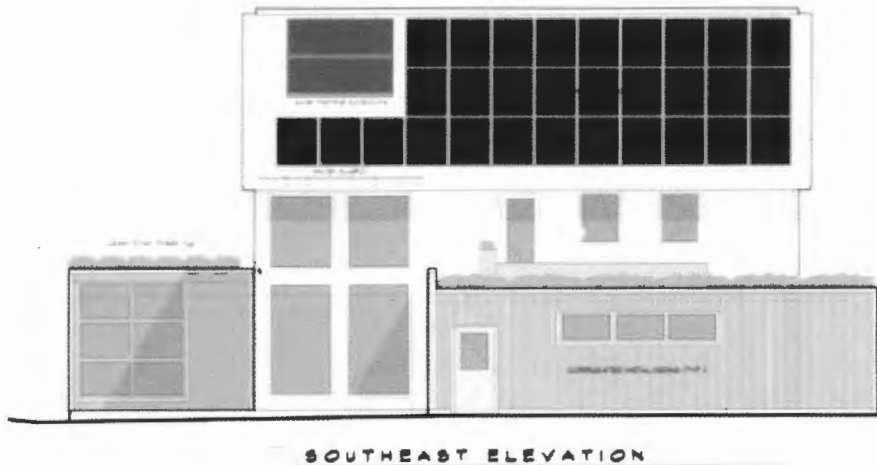
Figure 1: NAS20053, NAS20083, NAS20123

Figure 2: NAS20082, NAS20122, NAS20124

Model	A	B	C	D	E	F	G	H	I	J	K
NAS20053	22"	48½"	39¾"	39¾"	31½"	16¾"	6½"	n/a	n/a	n/a	n/a
NAS20083	24"	64"	57½"	57½"	31½"	19¾"	6½"	5"	n/a	n/a	n/a
NAS20123	28"	65"	57¾"	57¾"	33¾"	16¾"	8"	6½"	n/a	n/a	n/a
NAS20082	24"	64"	57½"	57½"	49½"	46¾"	36½"	31½"	19¾"	6½"	5"
NAS20122	28"	65"	57¾"	57¾"	51¾"	49¾"	38¾"	33¾"	16¾"	8"	6½"
NAS20124	28"	65"	57¾"	57¾"	51¾"	49¾"	38¾"	33¾"	16¾"	8"	6½"

Application diagrams





ARRAY ORIENTATION:
135° (True)

ARRAY PITCH:
45° angle

Collectors to be mounted as shown in the elevation drawing to the left.

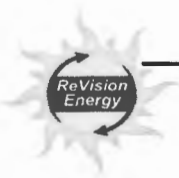
Project Summary

System	Performance	Cost	Incentives	Net Cost
Two Wagner Eco C20 flat plate solar hot water collectors with solar storage tank for heating domestic hot water supply	<ul style="list-style-type: none"> Produce roughly 11,592,000 Btu's of clean, renewable energy annually. Offset roughly 4,906 lbs. of CO2 emissions annually. 	\$10,700 Installed	-(\$3,210) 30% Federal Tax Credit -(\$1,750) Rebate from Efficiency Maine	\$5,740

Economic & Environmental Return on Investment

This solar energy system uses a clean, renewable 'fuel' called sunshine. Because it displaces finite, polluting and increasingly expensive fossil fuel, the solar energy system is guaranteed to pay for itself through avoided costs. After you get all of your initial solar investment back, the system will continue to deliver a valuable household revenue stream for years to come. Every time energy costs go up, your financial return on investment improves proportionally.

Plus, the system will be eliminating thousands of pounds of CO2 emissions each year, delivering a powerful environmental benefit for you, your community and future generations. ReVision Energy's experienced team of certified solar professionals delivers the peace of mind that comes from knowing you have the most robust, reliable solar energy system available in northern New England.



Major System Components

Based on an evaluation of your domestic hot water demand and current water heating situation, ReVision Energy proposes a closed loop antifreeze solar hot water system, utilizing:

- (2) Wagner EURO C20 AR flat plate solar thermal collectors with Sunarc solar glass.
- (1) Caleffi 119G solar storage tank with electric element backup
- (1) Wagner Euro Tric A Flush Mounting System
- (1) Flowstar solar pump station by Stiebel Eltron; includes temp. gauge, flow meter, and PRV
- (1) Stiebel Eltron SOM 6 plus Delta T controller with variable speed pump control
- (1) Caleffi Series 251 Air Separator
- (1) Caleffi Series 521 anti-scald mixing valve
- (1) Solar Expansion Tank

The system is designed for primary solar domestic water heating with seamless automatic backup from the electric element in the tank.

System Operation

Whenever the rooftop collectors are warmer than the water in the bottom of the storage tank, a differential temperature sensor automatically activates a solar circulating pump. Sun-heated antifreeze pumps up to the collectors, then down through a heat exchange coil located in the bottom of the storage tank. In the spring, summer and fall, the system will provide a significant fraction of your household's domestic hot water for showering, laundering, dishwashing, etc.

This is a closed-loop system, meaning that the non-toxic propylene glycol antifreeze never comes in contact with the domestic water supply. In case of unusually high hot water demand, or an extended period of cloudy weather when there isn't enough sun to heat the top of the tank to its set point, the back up electric element will take over. The integration of the solar hot water system and the backup element will ensure that you always have an ample supply of hot water.

General System Diagram



How Solar Hot Water Works

- 1 - Sun heats solar thermal collectors
- 2 - Differential temperature controller activates pump station, sending non-toxic antifreeze mix flowing through panels
- 3 - Solar heated antifreeze mix passes through heat exchanger in tank, heating water supply. Cycle continues as long as roof temperature is 10 degrees warmer than temperature in tank
- 4 - Solar heated water can be used for domestic hot water loads - showers, dishes, washing machines, etc.

Automatic 'steerback' mode for overheat and seamless backup





**Submission Data: Altherma Unit
EK-HB054BA6VJU
HYDROBOX HEATING ONLY**

Job Name: _____
 Purchaser: _____
 Submitted To: _____
 Submitted By: _____
 Unit Designation: _____

Location: _____
 Engineer: _____
 For: Reference Approval Construction
 Date: _____

Connected to ERLQ036:

Nominal pump ESP (Heating)	7.34 psi
Nominal pump ESP (Cooling)	-
Waterside Heat Exchanger : Volume	0.27 gal
Flow rate Min/Max	4.23/15.32 gpm
Nominal flow rate (Heating)	8.47 gpm
Nominal flow rate (Cooling)	-

Connected to ERLQ048:

Nominal pump ESP (Heating)	5.48 psi
Nominal pump ESP (Cooling)	-
Waterside Heat Exchanger : Volume	0.27 gal
Flow rate Min/Max	4.23/15.32 gpm
Nominal flow rate (Heating)	10.59 gpm
Nominal flow rate (Cooling)	-

Connected to ERLQ054:

Nominal pump ESP (Heating)	3.92 psi
Nominal pump ESP (Cooling)	-
Waterside Heat Exchanger : Volume	0.27 gal
Flow rate Min/Max	4.23/15.32 gpm
Nominal flow rate (Heating)	12.12 gpm
Nominal flow rate (Cooling)	-

Connected to all Outdoor units:

Expansion Vessel Volume	2.64 gal
Max. water pressure	43.5 psi
Pre Pressure	14.3 psi
Water Inlet/Outlet Piping Connrt.	1-1/4" Male BSP
Total water volume	1.45 gal
Leaving Water Temp (Heating) (59) 77~131°F* [(15) 25~55°C]	
Leaving Water Temp (Cooling)	-
Refrigerant Connection - Gas side	5/8" OD (flare)
- Liquid Side	3/8" OD (flare)
Pump: No. of speed	3

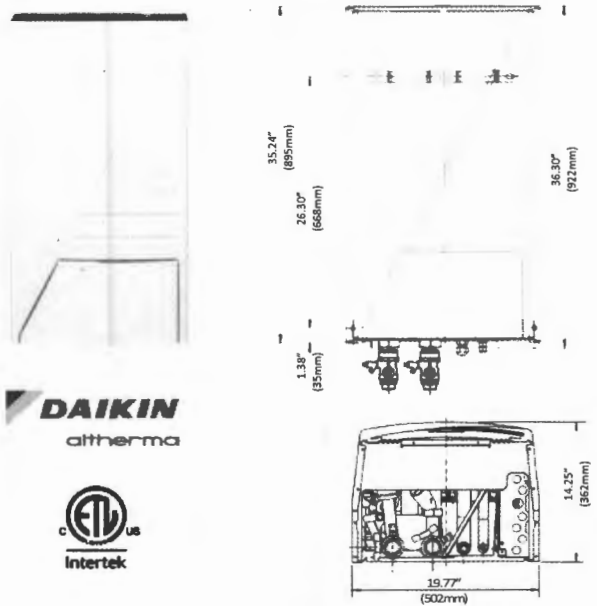
*Back up heater operation between 59°F(15°C) and 77°F(25°C)

Power Supply:

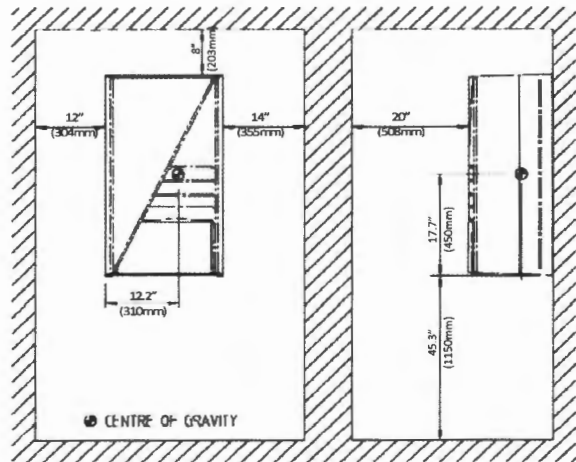
Main Power (fed from outdoor unit)	208-230V/1Ph/60Hz
Back-up Heater Power Supply	208-230V/1Ph/60Hz
Back-up heater capacity	6 kW
Minimum Circuit Amps (MCA)	28.6 Amps
Maximum Overcurrent Protection (MOP)	30.0 Amps

Unit Data:

Dimensions (HxWxD)	36-5/16 x 19-3/4 x 14-7/32
Weight	123 lbs



For further information about the installation, please refer to the Installation and Engineering Guides



Service & Clearance Space Hydrobox

Standard Features:

Parts warranty	5 years
Limited labor warranty	1 year

Options:

BSP to NPT Connection Adaptor	DACA-HBA-1
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Daikin AC (Americas), Inc. ♦ 1645 Wallace Drive – Suite 110 ♦ Carrollton, TX 75006

Daikin's products are subject to continuous improvements. Daikin reserves the right to modify product design, specifications and information in this data sheet without notice and without incurring any obligations



Professional design, installation and service of renewable energy systems

Heating System Proposal

Client: John Gordon
Location: 363 Deering Avenue, Portland, ME
Date: May 21, 2012

System Overview

To meet the goals of energy efficiency, convenience, and comfort, and working towards a net zero building, ReVision Energy proposes installation of an air-source heat pump based heating system for 363 Deering Ave. new construction project. The heat pump's Hydrobox will be located in the utility room and will supply hot water to radiant tubing throughout the building. The outdoor unit will be mounted outside the building in a mutually agreeable location. The system is designed to have multiple heating. The heating system design is based on a 70 degree indoor set point temperature.

System	Performance	Cost
Altherma 030 Air Source Heat Pump with radiant distribution.	<ul style="list-style-type: none">7,600 kilowatt hour annual energy consumption for heating	\$24,770 Installed

Major Components

ReVision Energy will provide the following major components:

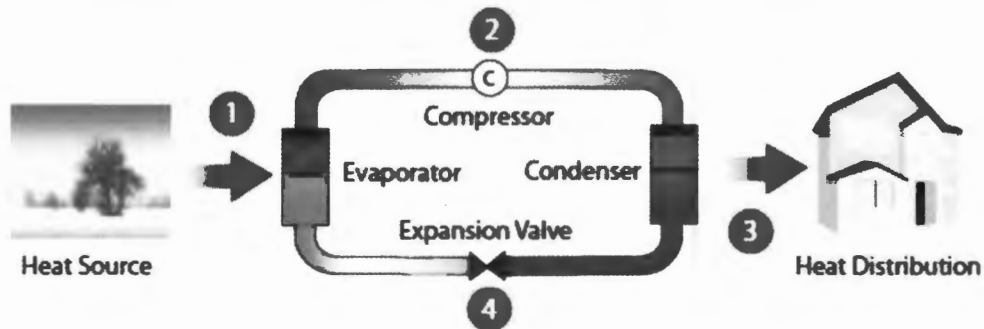
- Daikin Altherma indoor Hydrobox unit
- Daikin Altherma outdoor unit
- Radiant Tubing
- Radiant distribution manifold w/ flow meters and balance valves
- All pumps, valves, drains, air eliminators, expansion tanks, thermometers, and other equipment required



Professional design, installation and service of solar energy systems

How Heat Pumps Work

A "Heat Pump" is a mover of heat, utilizing the available renewable heat from the outside air. It works on the same principle as a refrigerator, but in reverse!



1 STAGE ONE

The heat transfer medium (the refrigerant) is colder than the heat source (the outside air). As the outside air passes across the first heat exchanger (the evaporator) the liquid refrigerant absorbs the heat and evaporates.

2 STAGE TWO

The vapor then passes to the compressor and is compressed. When compressed the pressure is increased and the temperature of the vapour rises, effectively concentrating the heat.

3 STAGE THREE

The hot vapor passes to the second heat exchanger (the condenser) where the heat is rejected and the vapor condenses back into a liquid. In the case of Altherma the rejected heat is passed into the water of the central heating and hot water system ready for use in the home.

4 STAGE FOUR

The liquid refrigerant then passes through an expansion valve, reducing its pressure and temperature, ready to start the whole cycle once again.



Wagner & Co

SOLAR TECHNOLOGY

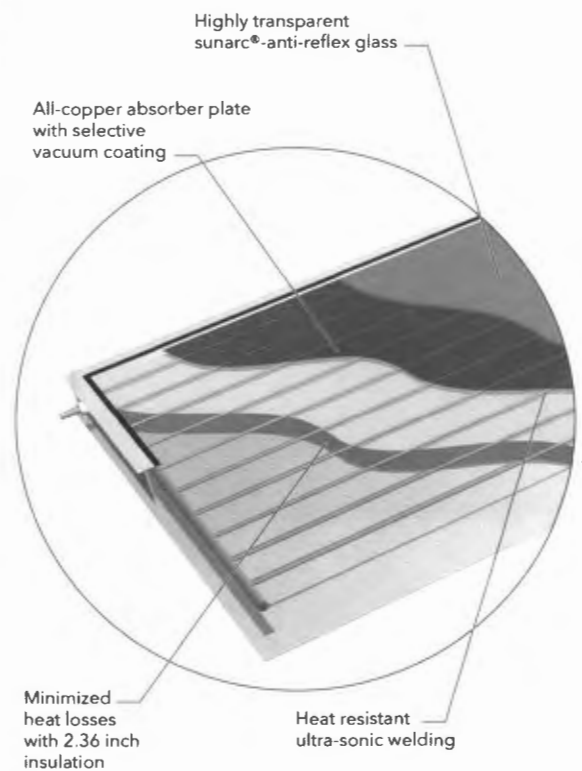
EURO C20 AR-M Flat Plate Collector

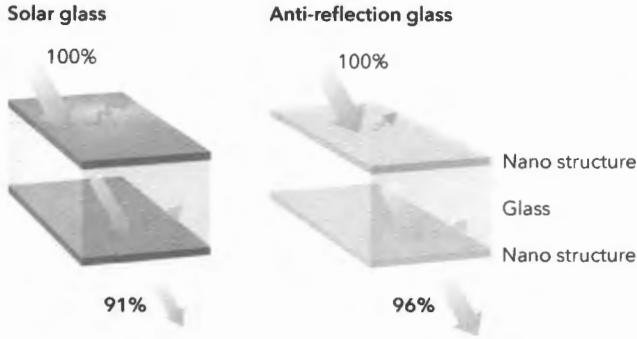
Top Performance with Anti-Reflex Glass



12 Years of Collector Engineering

- sunarc® anti-reflex glass with an ultrafine nano surface structure increases the light transmissivity from 91% to 96%. The energy output improves by 6 to 10%.
- Selective vacuum coating of the absorber plate captures maximum solar heat and minimizes radiation losses.
- The all-copper absorber plate is ultrasonically welded to a double harp register.
- The 2.36 inch of insulation at the back side minimizes heat losses and assures high temperatures.
- Vertical and horizontal installation either on-roof or free-standing using TRIC.





Perfection in Detail - Top Rating

More Light Transmission for High Yields

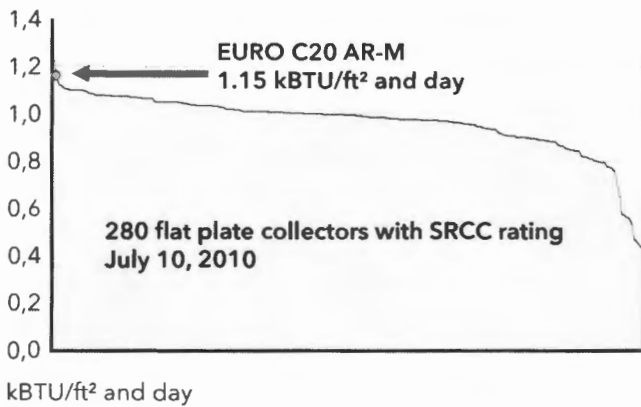
The special nano-structure on the inner and outer side of the sunarc® anti-reflection glass increases the light transmission from 91% to 96%.

Depending on the situation, the increased transmission boosts the performance of the collector by up to 9%!

Absorber with Optimized Heat Transfer

An ultrasonically welded full-plate absorber is the heart of the EURO C20 AR-M. The double harp absorber is made with a copper sheet using high selective coating and 10 riser pipes.

Collector Performance Rating for Clear Day, Cat. C



Top Rating

The EURO C20 AR-M has been tested and certified to SRCC OG100 standard. Thanks to its uncompromising design and quality, the collector rates at a top position among the SRCC list.

Fast Track Mounting for Lasting Installations

The TRIC mounting systems made from corrosion resistant aluminium and stainless steel components stand for fast and reliable collector racking on the roof. The pre-assembled racking systems allow safe and stable mounting on tilted and flat roof with practically every type of roofing. All bolts are accessible from above, thus enabling time effective installations.



EURO C20 AR-M / Collector Specification

Collector area	Gross area 28.1 sqft (2.61 m ²) Aperture area 25.4 sqft (2.36 m ²)
Dimensions	7' x 4' x 4.3" (2151 x 1215 x 110 mm, L x W x H)
Casing	Aluminium frame with seamless side and 2.36 inch back insulation
Glass cover	0.16 inch solar safety glass with sunarc® anti-reflection surface, $\tau = 96\%$
Absorber	Full surface absorber with highly selective vacuum coating; $\alpha = 95\%$; $\epsilon = 5\%$
Rating*	SRCC OG100 Collector Performance Rating: Clear Day, Category C: 32.4 kBTU/Day * SRCC Collector Certification Number: 100-2010035A

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