

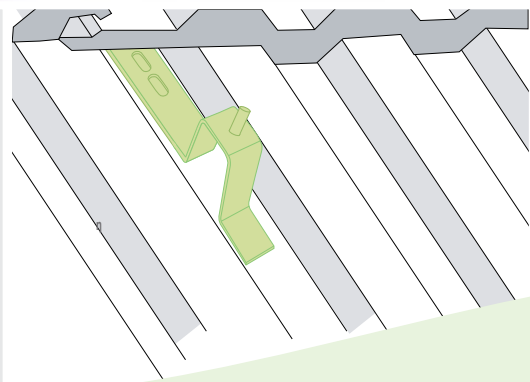
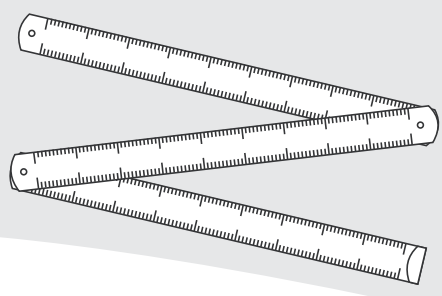


# PERFORMANCE SERIES Direct Flow Collectors



**Innovation prize 2008**  
for the NARVA vacuum tubes.

From glass factory to finished high performance vacuum tubes, HighTech "Made in Germany".



**QUALITÄTS-MANAGEMENT**  
Wir sind zertifiziert  
Regelmäßige freiwillige  
Überwachung nach ISO 9001:2000



**Installation instruction  
Direct Flow**



Installation instructions for:

NTS PS10 DF + NTS PS20 DF + NTS PS30 DF



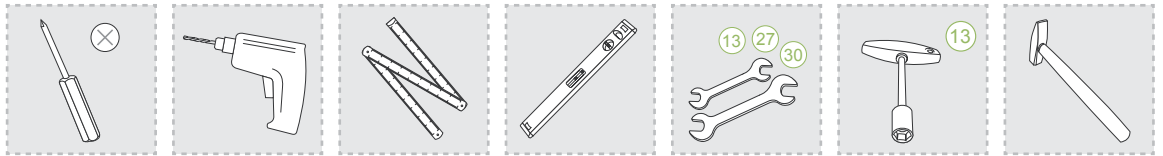
**General information:**

The tube sets should be transported horizontally. Only up to max. 7 cartons may be stacked on top of one and other. Our installation sets are valid for all snow load zones (except Zone 3). In storm areas, special structural analyses must be carried out.

**Work safety information:**

Wear a helmet, hearing protection and protective glasses! Attach fall protection equipment! Handle glass tubes only while wearing gloves (are included)

**Required tools:**



**Possible installation types:**

Flat roof, facade, tiled roof (roofing tile), corrugated metal roof

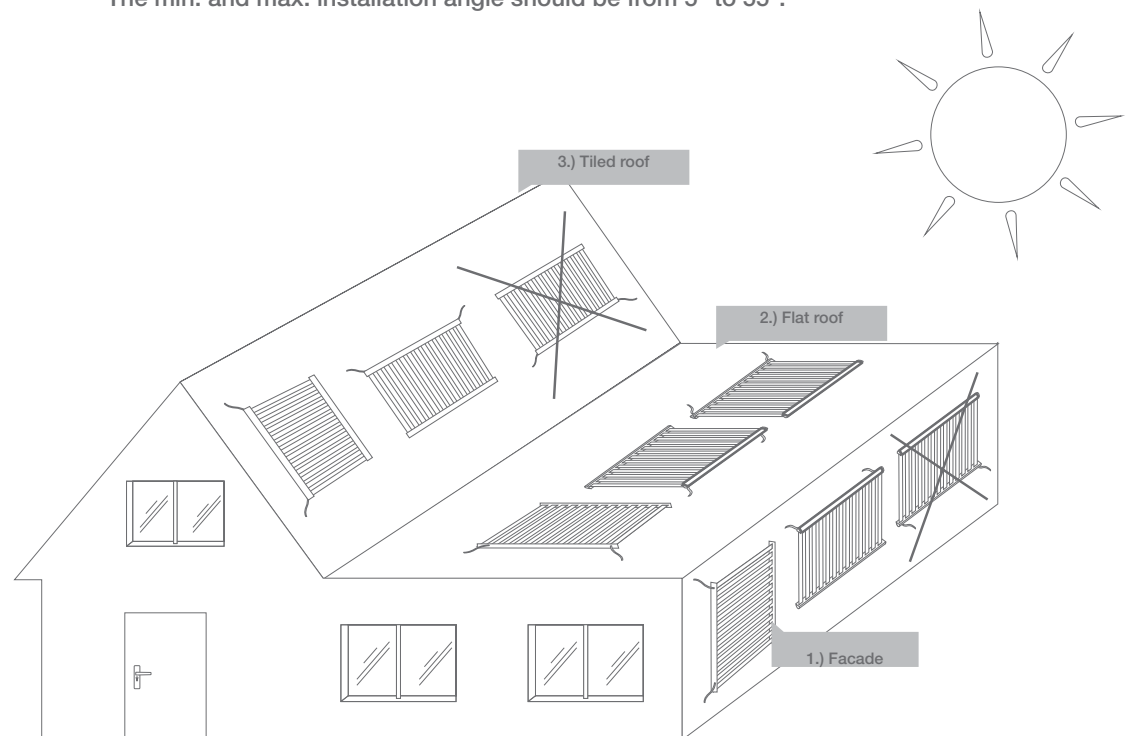


**Caution!**

The collectors are to be installed so that the distributor tube is in position at either the top or on the left or right side.

Please make sure that the tubes can be oriented towards the sun.

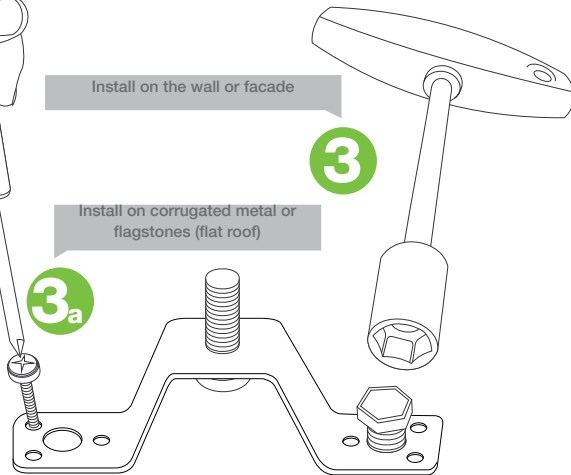
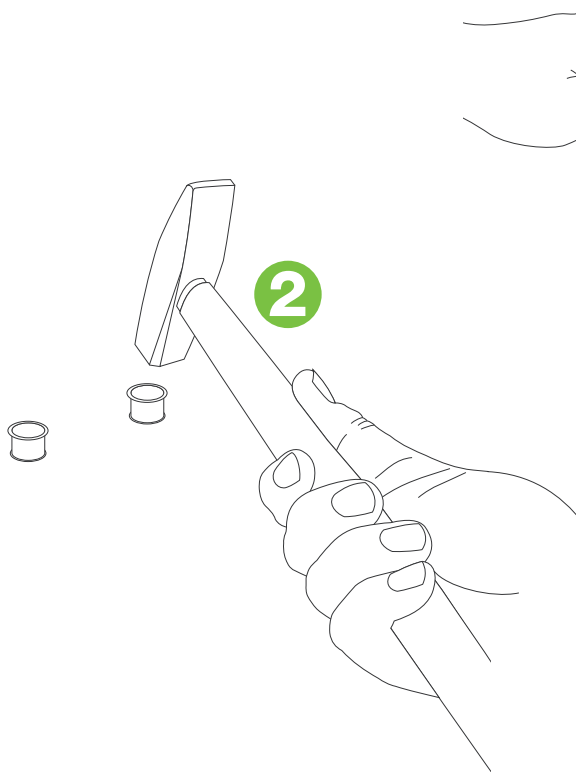
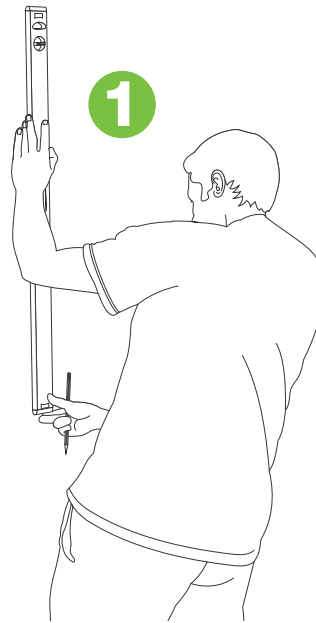
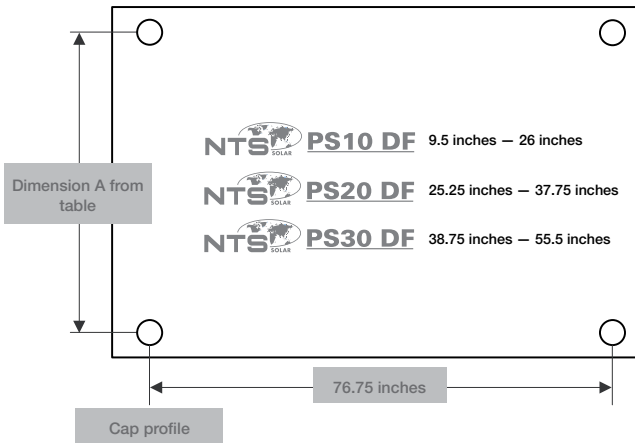
The min. and max. installation angle should be from 5° to 55°.





Set the cap profile in the facade or elevated track.  
For wall/facade installation, the cap profile is to be vertically mounted.

**Wall/facade, flat roof and corrugated metal installation (Roof and wall):**



Mark **1**, drill, insert wall plug **2**, install cap profile with key screw NW 13 mm **3**, mount with suitable screws for corrugated metal and flat roof installation **3a**. Slide reflectors - if available - onto the cap profile and secure with nuts.

• **Flat roof installation:**

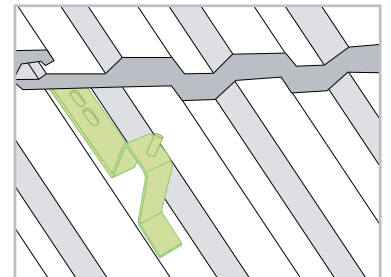
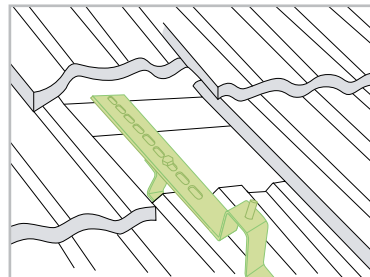
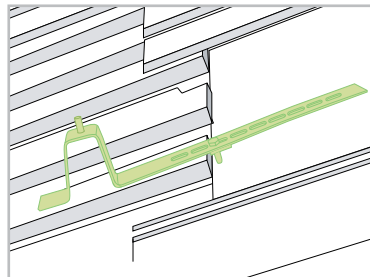
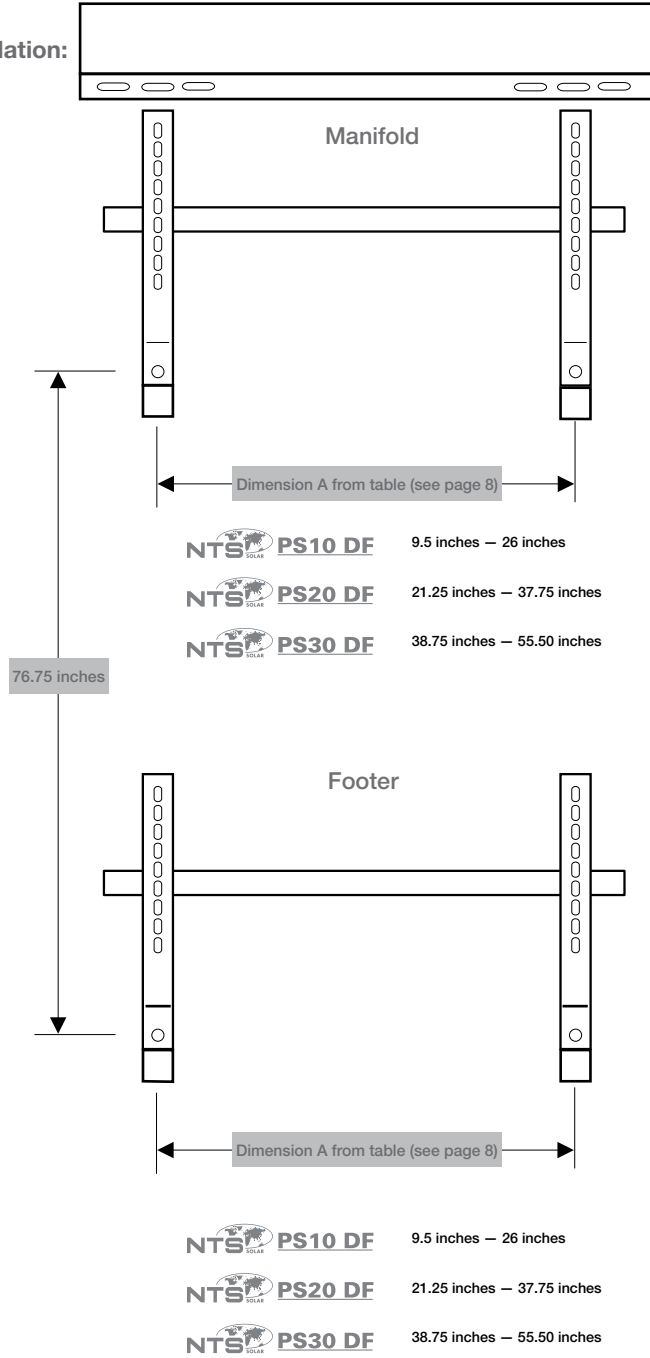
For flat roof installation, the cap profile is to be mounted on approx. 40x40 cm flagstones and laid flat on the roof.

• **Corrugated metal installation (roof+wall):**

Screw the cap profile onto the trapezoid tin using self-cutting drill screws (sealing: Silicone among others). Collector installation same as all other types of fastenings.



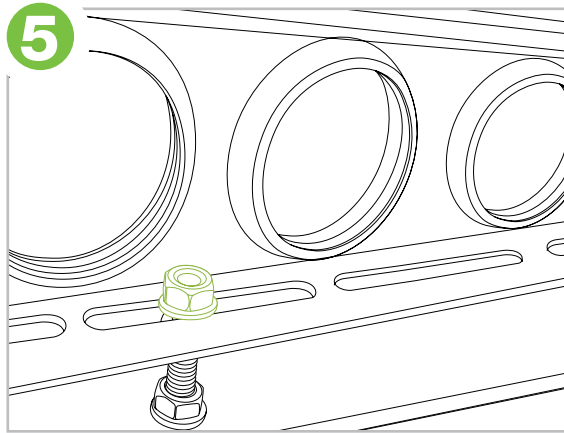
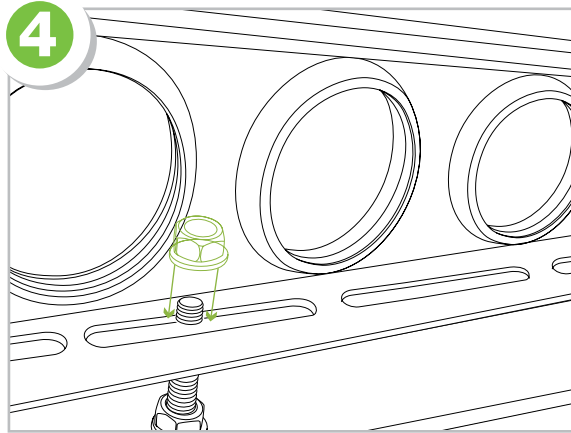
• Tiled roof installation:



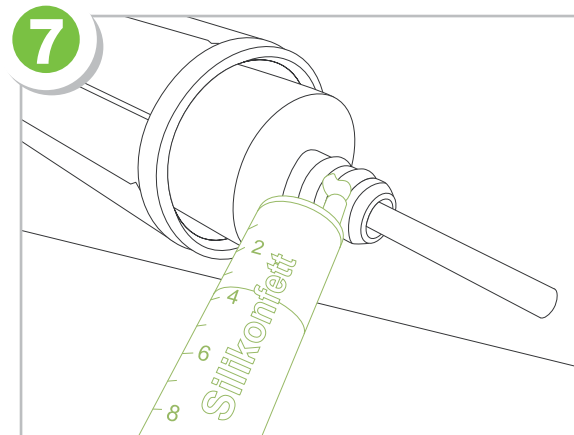
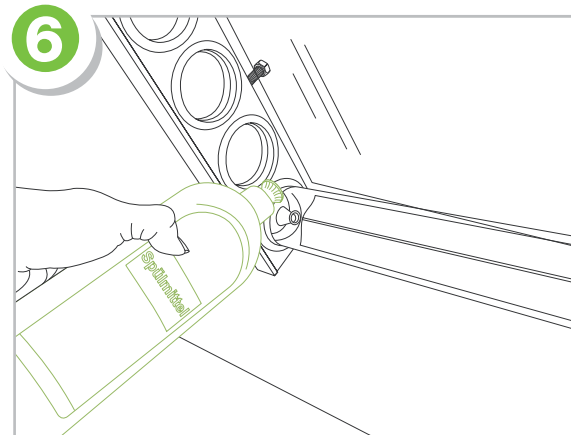
**Install the supporting bracket:**

Attach with Locking nut - screw nut M8. **4+5**

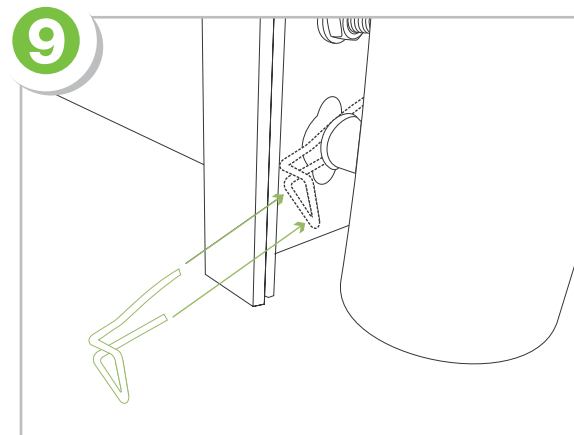
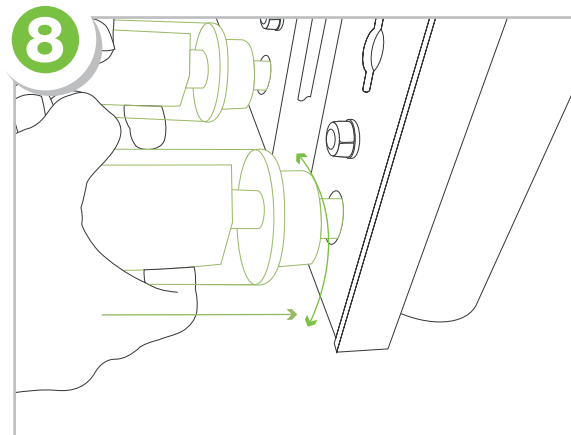
When installing multiple collectors in series, make sure that the o-ring connector is completely inserted into both collectors. Collector casing and drum must be mounted straight and flush with each other.



Following this insert the tubes. **Important!** Lubricate the rubber rings on the foot with dishwashing detergent so that the vacuum tube can be easily inserted. **6**



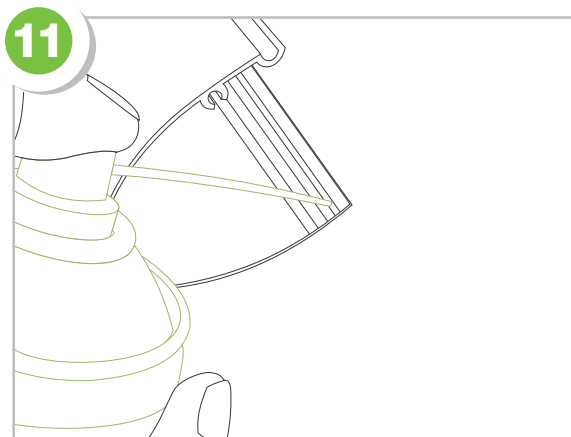
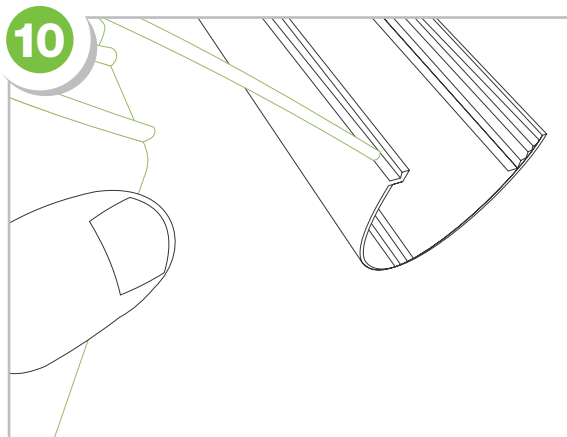
**Important!** Grease the O-rings of the tubes with silicone grease **7** (use only the enclosed acid free silicone grease). Constantly rotate the vacuum tube while inserting. **8** Then insert the tube into the other supporting bracket/drum and secure with clip connectors! **9**



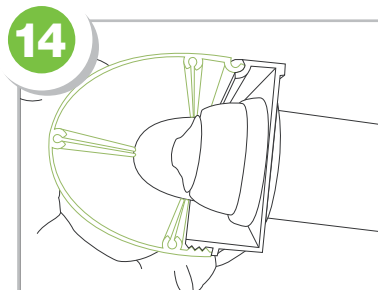
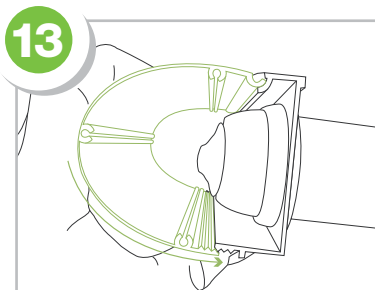
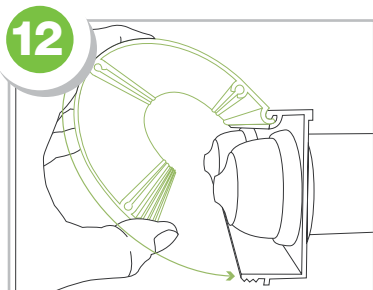


Mount the end cap and connection tube 10 + 11 :

Spray the screw-in connection and cogging of the supporting bracket with e.g. WD 40 or LM 40!

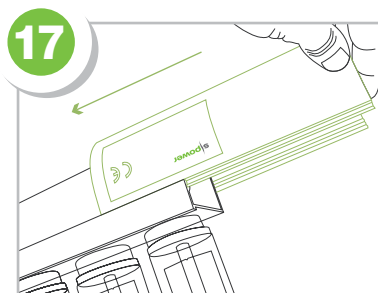
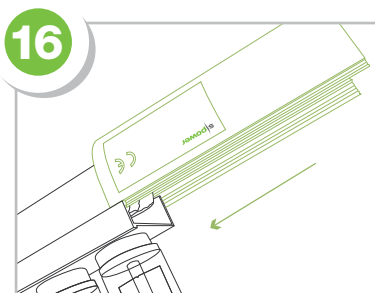
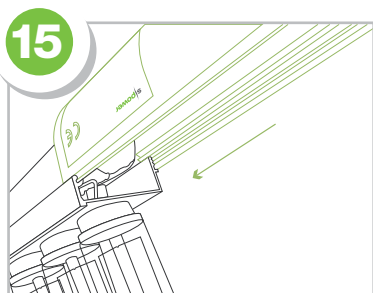


Foot:

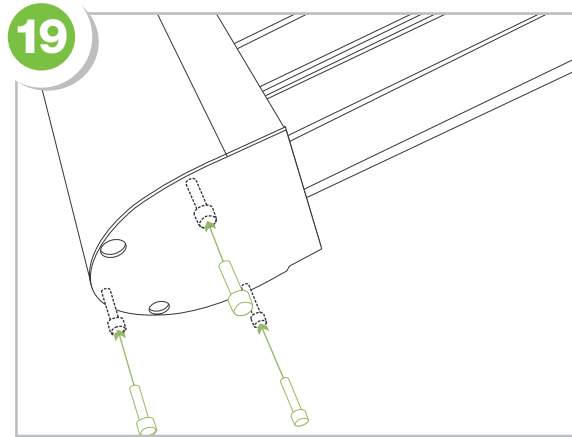
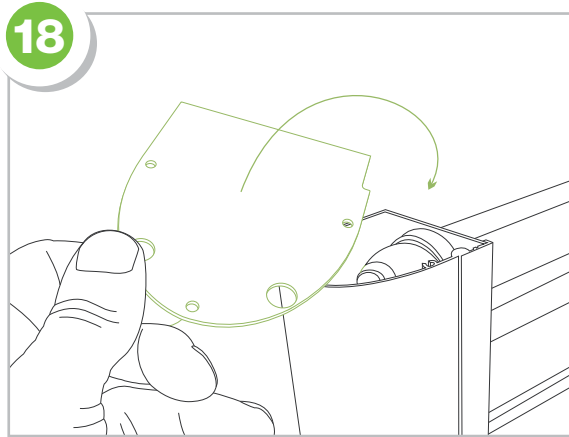


Drum:

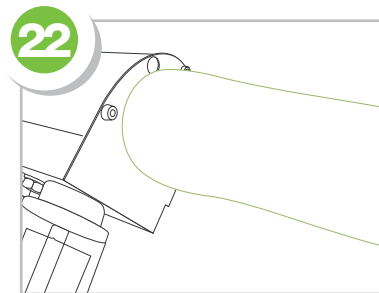
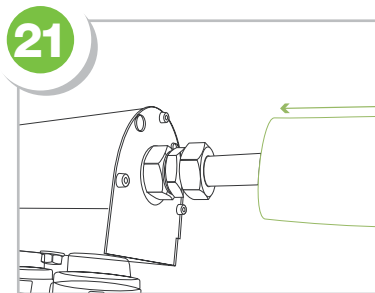
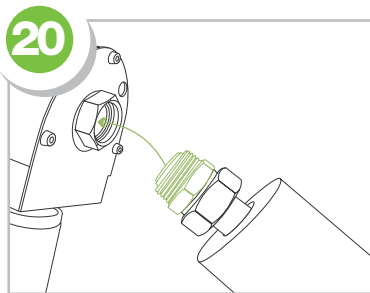
Push the casing of the drum over the supporting bracket! 15 + 16 + 17



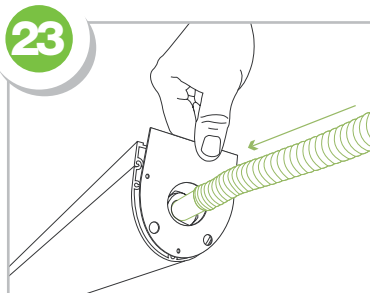
For all types of installations:  
Mount the end cap. 18 + 19



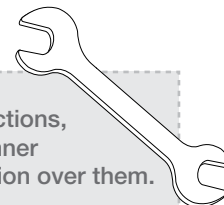
**i** **Caution!** The Euro-conus connector or the sensor T-piece should always be mounted on the collector discharge side. For laterally-inverted connections, the adapter (Art.-No. 791104) should be used.



On the left hand side: Grease the O-ring of the collector connection with silicone grease, connect the corrugated hose, push the side cap over the corrugated hose and mount. Following this pull the insulation over the hose. 23



Screw on the connections,  
pull tight with a spanner  
and push the insulation over them.






We are available for questions concerning the installation of our high quality vacuum tube collectors at any time:

NTS Solar  
233 Libbey Industrial Parkway  
Weymouth, MA 02189  
Phone: (888) 781-4545  
Fax: (781) 331-4766

E-mail: [info@nts-solar.com](mailto:info@nts-solar.com)  
Internet: [www.nts-solar.com](http://www.nts-solar.com)

<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p><b>SRCC OG-100</b></p>	<p><b>CERTIFIED SOLAR COLLECTOR</b></p> <p><b>SUPPLIER:</b> NTS Solar 233 Libbey Industrial Parkway Weymouth, MA 02189 USA</p> <p><b>MODEL:</b> PS-20DF</p> <p><b>COLLECTOR TYPE:</b> NTS Tubular</p> <p><b>CERTIFICATION#:</b> 2010103B</p>
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**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of BTU Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY	CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY
A (-5 °C)	34.1	25.4	16.8	A (-9 °F)	32.3	24.1	15.9
B (5 °C)	32.7	24.0	15.4	B (9 °F)	31.0	22.8	14.6
C (20 °C)	30.1	21.4	12.8	C (36 °F)	28.6	20.3	12.1
D (50 °C)	24.0	15.5	7.2	D (90 °F)	22.7	14.7	6.8
E (80 °C)	16.2	8.6	1.9	E (144 °F)	15.4	8.1	1.8

A- Pool Heating (Warm Climate) B- Pool Heating (Cool Climate) C- Water Heating (Warm Climate) D- Water Heating (Cool Climate) E- Air Conditioning

Original Certification Date: 04-NOV-10

**COLLECTOR SPECIFICATIONS**

<b>Gross Area:</b>	3.184 m <sup>2</sup>	34.27 ft <sup>2</sup>	<b>Net Aperature Area:</b>	2.17 m <sup>2</sup>	23.40 ft <sup>2</sup>
<b>Dry Weight:</b>	50.8 kg	112. lb	<b>Fluid Capacity:</b>	3.2 liter	0.8 gal
<b>Test Pressure:</b>	1500. KPa	218. psig			

**COLLECTOR MATERIALS**

<b>Frame:</b>	Aluminum
<b>Cover (Outer):</b>	Soda Lime Glass
<b>Cover (Inner):</b>	

**Pressure Drop**

Flow		ΔP	
ml/s	gpm	Pa	in H <sub>2</sub> O

<b>Absorber Material:</b>	Tube - Copper / Plate - Copper
<b>Absorber Coating:</b>	Selective coating

<b>Insulation Side:</b>	EPDM
<b>Insulation Back:</b>	EPDM

**TECHNICAL INFORMATION**

<b>Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]</b>	<b>Y INTERCEPT</b>	<b>SLOPE</b>
<b>S I UNITS:</b> η= 0.487 -1.09840 (P)/I -0.01077 (P) <sup>2</sup> /I	<b>0.490</b>	<b>-1.716 W/m<sup>2</sup>.°C</b>
<b>I P UNITS:</b> η= 0.487 -0.19348 (P)/I -0.00105 (P) <sup>2</sup> /I	<b>0.490</b>	<b>-0.302 Btu/hr.ft<sup>2</sup>.°F</b>


<b>Incident Angle Modifier [(S)=1/cosθ - 1, 0°&lt;θ&lt;=60°]</b>	
<b>Kτα = 1</b>	-0.056 (S) -0.018 (S) <sup>2</sup>
<b>Kτα = 1</b>	-0.14 (S) Linear Fit

<b>Model Tested:</b>	2009062B
<b>Test Fluid:</b>	Water
<b>Test Flow Rate:</b>	10.9 ml/s.m <sup>2</sup> 0.0160 gpm/ft <sup>2</sup>

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.06(S)

November, 2010  
 Certification must be renewed annually, For current status contact:  
 SOLAR RATING & CERTIFICATION CORPORATION  
 c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

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<b>SOLAR COLLECTOR CERTIFICATION AND RATING</b>   <b>SRCC OG-100</b>	<b>CERTIFIED SOLAR COLLECTOR</b>  <b>SUPPLIER:</b> <b>NTS Solar</b> 233 Libbey Industrial Parkway Weymouth, MA 02189 USA  <b>MODEL:</b> PS-10DF <b>COLLECTOR TYPE:</b> NTS Tubular <b>CERTIFICATION#:</b> 2010103A
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### COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of BTU Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY	CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY
A (-5 °C)	17.3	12.9	8.5	A (-9 °F)	16.4	12.2	8.1
B (5 °C)	16.6	12.2	7.8	B (9 °F)	15.8	11.6	7.4
C (20 °C)	15.3	10.9	6.5	C (36 °F)	14.5	10.3	6.2
D (50 °C)	12.2	7.9	3.6	D (90 °F)	11.5	7.4	3.5
E (80 °C)	8.2	4.4	0.9	E (144 °F)	7.8	4.1	0.9

A- Pool Heating (Warm Climate) B- Pool Heating (Cool Climate) C- Water Heating (Warm Climate) D- Water Heating (Cool Climate) E- Air Conditioning

Original Certification Date: 04-NOV-10

### COLLECTOR SPECIFICATIONS

**Gross Area:**                   1.617 m<sup>2</sup>                   17.41 ft<sup>2</sup>  
**Dry Weight:**                19.2 kg                    42. lb  
**Test Pressure:**            1500. KPa                218. psig

**Net Aperature Area:** 1.09 m<sup>2</sup> 11.70 ft<sup>2</sup>  
**Fluid Capacity:**         1.6 liter 0.4 gal

### COLLECTOR MATERIALS

**Frame:**                        Aluminum  
**Cover (Outer):**             Soda Lime Glass  
**Cover (Inner):**

### Pressure Drop

Flow		ΔP	
ml/s	gpm	Pa	in H <sub>2</sub> O
20.00	0.32	424.82	1.71
50.00	0.79	1619.4	6.5
80.00	1.27	3482.77	14.00

**Absorber Material:**        Tube - Copper /  
Plate - Copper  
**Absorber Coating:**       Selective coating

**Insulation Side:**           EPDM  
**Insulation Back:**         EPDM

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]**

				Y INTERCEPT	SLOPE
<b>S I UNITS:</b>	$\eta = 0.487$	$-1.09840 (P)/I$	$-0.01077 (P)^2/I$	<b>0.490</b>	<b>-1.716 W/m<sup>2</sup>.°C</b>
<b>I P UNITS:</b>	$\eta = 0.487$	$-0.19348 (P)/I$	$-0.00105 (P)^2/I$	<b>0.490</b>	<b>-0.302 Btu/hr.ft<sup>2</sup>.°F</b>

**Incident Angle Modifier [(S)=1/cosθ - 1, 0°<θ<=60°]**

**K<sub>τα</sub> = 1**                   -0.056 (S)                   -0.018 (S)<sup>2</sup>  
**K<sub>τα</sub> = 1**                   -0.14 (S)                   Linear Fit

**Model Tested:**            2009062A

**Test Fluid:**                Water

**Test Flow Rate:**         21.4 ml/s.m<sup>2</sup> 0.0315 gpm/ft<sup>2</sup>

#### REMARKS:

Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.06(S)


November, 2010

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<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p><b>SRCC OG-100</b></p>	<p><b>CERTIFIED SOLAR COLLECTOR</b></p> <p><b>SUPPLIER:</b> NTS Solar 233 Libbey Industrial Parkway Weymouth, MA 02189 USA</p> <p><b>MODEL:</b> PS-30DF</p> <p><b>COLLECTOR TYPE:</b> NTS Tubular</p> <p><b>CERTIFICATION#:</b> 2010103C</p>
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**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of BTU Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY	CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY
A (-5 °C)	51.3	38.2	25.3	A (-9 °F)	48.7	36.2	23.9
B (5 °C)	49.3	36.1	23.2	B (9 °F)	46.7	34.3	22.0
C (20 °C)	45.4	32.2	19.3	C (36 °F)	43.0	30.6	18.3
D (50 °C)	36.1	23.3	10.8	D (90 °F)	34.2	22.1	10.2
E (80 °C)	24.4	12.9	2.8	E (144 °F)	23.1	12.2	2.6

A- Pool Heating (Warm Climate) B- Pool Heating (Cool Climate) C- Water Heating (Warm Climate) D- Water Heating (Cool Climate) E- Air Conditioning

Original Certification Date: 04-NOV-10

**COLLECTOR SPECIFICATIONS**

<b>Gross Area:</b>	4.792 m <sup>2</sup>	51.58 ft <sup>2</sup>	<b>Net Aperature Area:</b>	3.26 m <sup>2</sup>	35.11 ft <sup>2</sup>
<b>Dry Weight:</b>	67.5 kg	149. lb	<b>Fluid Capacity:</b>	4.8 liter	1.3 gal
<b>Test Pressure:</b>	1500. KPa	218. psig			

**COLLECTOR MATERIALS**

<b>Frame:</b>	Aluminum
<b>Cover (Outer):</b>	Soda Lime Glass
<b>Cover (Inner):</b>	

**Pressure Drop**

Flow		ΔP	
m/s	gpm	Pa	in H <sub>2</sub> O

<b>Absorber Material:</b>	Tube - Copper / Plate - Copper
<b>Absorber Coating:</b>	Selective coating

<b>Insulation Side:</b>	EPDM
<b>Insulation Back:</b>	EPDM

**TECHNICAL INFORMATION**

<b>Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]</b>	<b>Y INTERCEPT</b>	<b>SLOPE</b>
<b>S I UNITS:</b> η= 0.487 -1.09840 (P)/I -0.01077 (P) <sup>2</sup> /I	<b>0.490</b>	<b>-1.716 W/m<sup>2</sup>.°C</b>
<b>I P UNITS:</b> η= 0.487 -0.19348 (P)/I -0.00105 (P) <sup>2</sup> /I	<b>0.490</b>	<b>-0.302 Btu/hr.ft<sup>2</sup>.°F</b>

<b>Incident Angle Modifier [(S)=1/cosθ - 1, 0°&lt;θ&lt;=60°]</b>	
<b>Kτ<sub>a</sub> = 1</b>	-0.056 (S) -0.018 (S) <sup>2</sup>
<b>Kτ<sub>a</sub> = 1</b>	-0.14 (S) Linear Fit

<b>Model Tested:</b>	2009062C
<b>Test Fluid:</b>	Water
<b>Test Flow Rate:</b>	7.2 ml/s.m <sup>2</sup> 0.0106 gpm/ft <sup>2</sup>

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.06(S)

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