

virtu^{PVT}

More energy, less space

Virtu^{PVT} Specification Sheet 2021_v1

Solar
Redefined



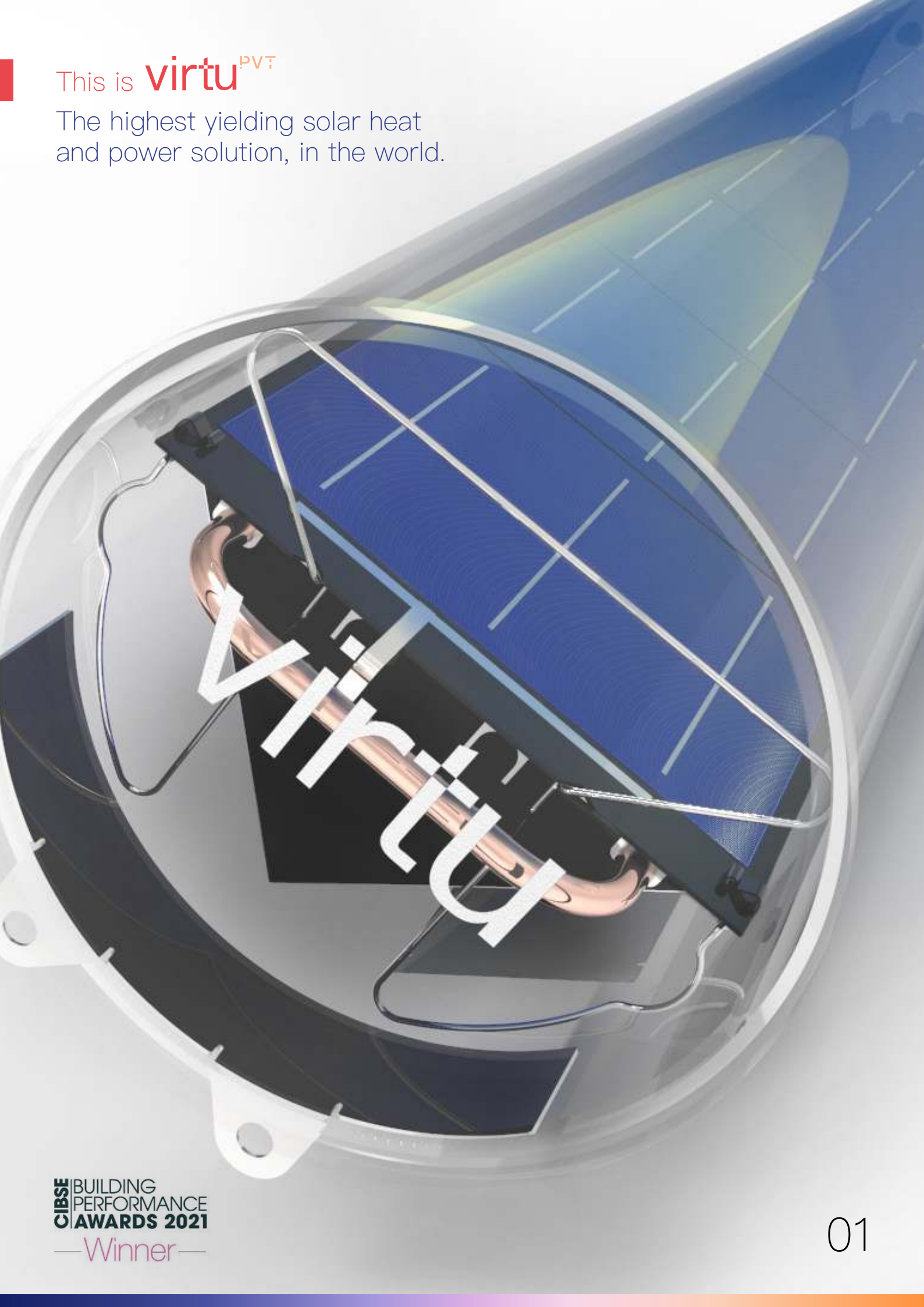
Naked Energy.

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This is **virtu**^{PVT}

The highest yielding solar heat
and power solution, in the world.



Why Virtu^{PVT} is preferred by our customers

Up to 3 x CO₂ savings per m²

Virtu^{PVT} decarbonises both heat and power

- > Combining heat and power, delivers 3 times the savings compared to PV
- > Decarbonises both scope 1 (heat) and scope 2 (power) emissions, mitigating need for additional measures, e.g. carbon offset payments
- > Utilising renewable energy improves building ratings and supports the transition to a zero carbon economy

More versatile

Virtu^{PVT} has exceptional performance on flat or pitched roofs and vertical façades

- > Low profile, tubular design avoids wasted space and shading
- > Integrated reflectors enable Virtu to capture 40% more energy compared to conventional PV
- > Collectors can be rotated, optimising performance on pitched roofs, flat roofs and vertical facades
- > The vacuum tube minimises thermal losses to the atmosphere, resulting in high efficiency even in cold weather
- > Can handle high temperatures and withstand stagnation if it occurs

Up to 50% greater financial returns per m²

Virtu^{PVT} is designed to maximise the solar potential of your roof

- > Requires significantly less space than separate thermal and PV systems
- > Reduces energy bills and provides security against energy price inflation
- > Eligible for many Government backed subsidies
- > Fully funded option available. Just pay for the energy you use

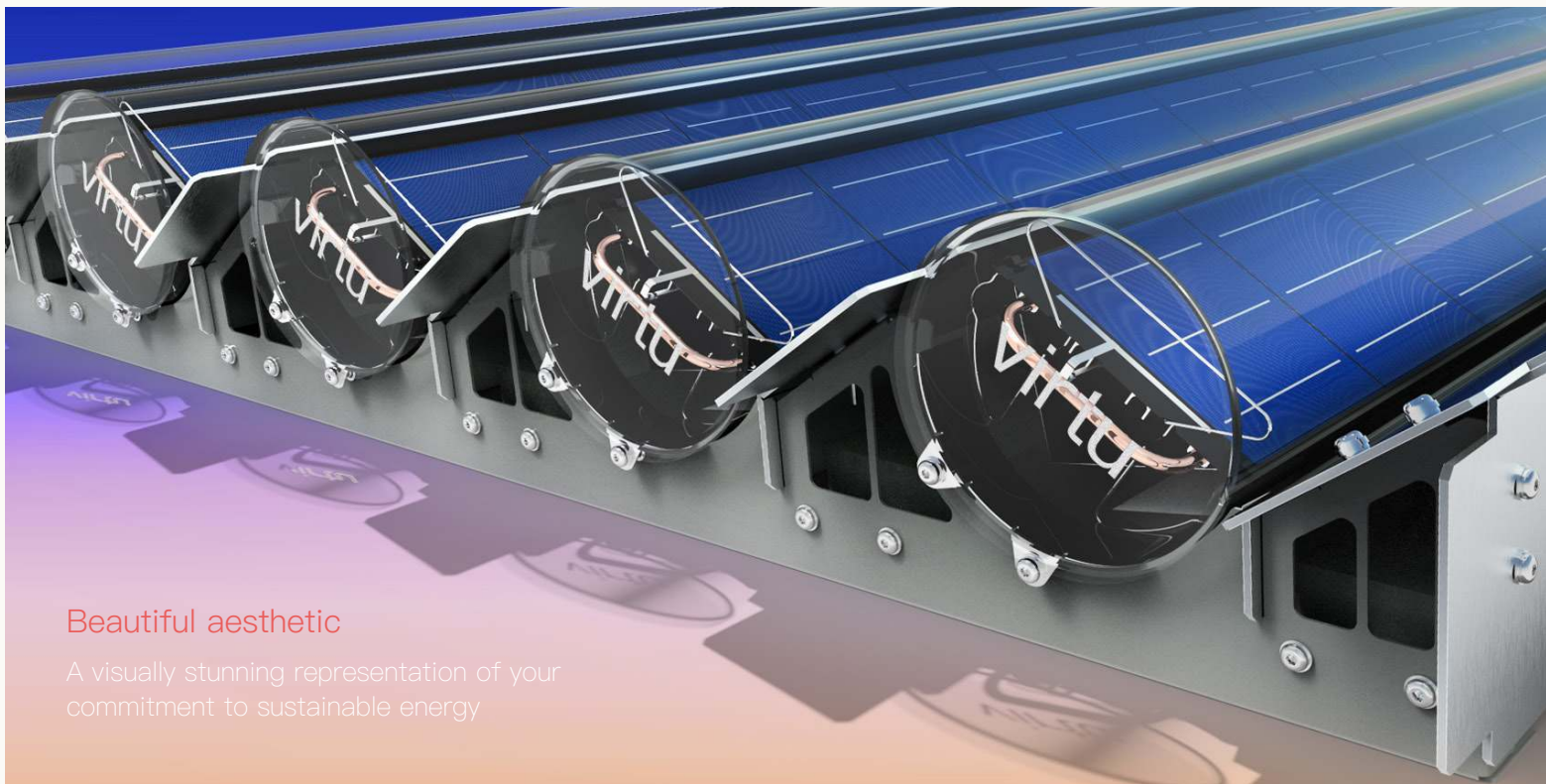
Lower install and maintenance costs

A design-led architecture and turnkey solution makes Virtu^{PVT} easy to install

- > Low profile design reduces wind shear and the need for ballast or piercing roof membranes
- > Modular design enables quicker, cheaper installation requiring only one installer and maintenance contract, unlike separate PV + thermal systems that require two designs, two installers and two trips to the roof
- > Remote monitoring platform for performance data and alerts
- > Low maintenance and backed by a warranty of up to 10 years

Beautiful aesthetic

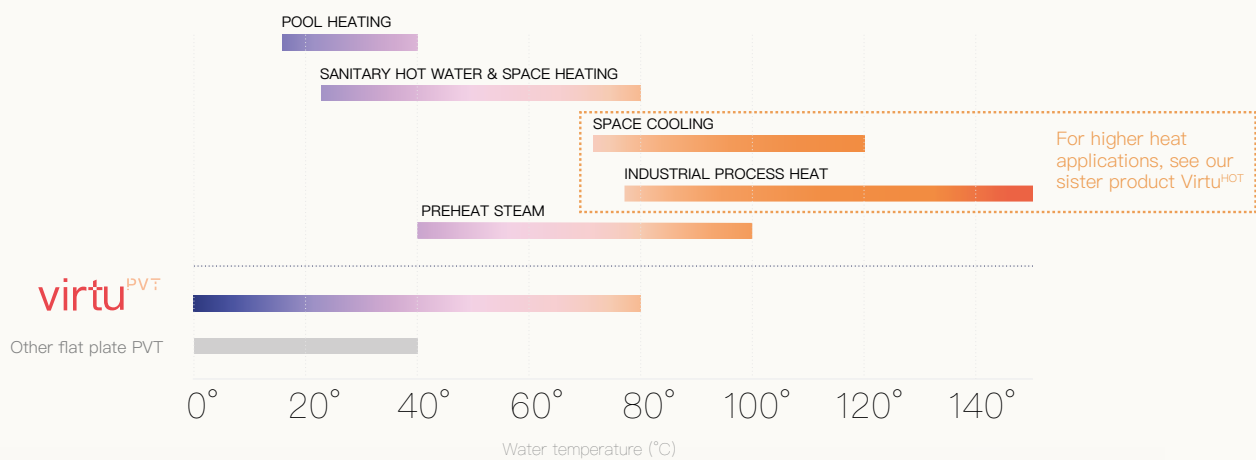
A visually stunning representation of your commitment to sustainable energy



Suitable for buildings with high heat demand such as:

- ✓ Multi-dwelling residential
- ✓ Public buildings e.g. hospitals
- ✓ Manufacturing
- ✓ Food & beverage
- ✓ New residential developments
- ✓ Hospitality & leisure

Virtu^{PVT} provides the ideal temperature to support many commercial and industrial processes:



Photovoltaic cells

High-efficiency monocrystalline PERC cells convert more than 20% of the sun's energy into electricity.

Electrical connection

Electrical connection is via standard MC4 connectors, making Virtu as easy to connect as a PV array.

Novel aluminium absorber plate

Another 60% of the sun's energy is extracted from the cells as heat, and is transferred to fluid channels behind the absorber plate.

Glass vacuum tube

A borosilicate vacuum tube prevents heat loss to the surroundings, allowing Virtu to provide useful heat over a wide temperature range, and in cold climates.

Copper water connection

8mm pipes connect to a 22 mm manifold with DN16 connectors, which can be plumbed into the building using standard solar thermal pipework.

Low install cost

- > Simple modular assembly
- > Lifted to roof pre or post assembly
- > Fits in service elevators
- > Use of a crane not necessary
- > Mounting included
- > Pipe manifolds included

Low Profile

- > 26.5 cm height from roof/façade
- > Simplifies planning permission
- > Low wind shear



Compatible with any roof type

6 X M8 mounting slots provide compatibility with, for example, clamp and rail systems

- > Suitable for:
 - ✓ Raised seamed roofs
 - ✓ Trapezoidal roofs
 - ✓ Sarnafil roofs
 - ✓ Nicholson fittings
 - ✓ Pitched roofs
 - ✓ Façade mounting

Self ballasting

In-built ballast trays can be loaded with concrete blocks

- > No need for roof penetration
- > No need for additional mounting
- > Suitable for:
 - ✓ Felt roofs
 - ✓ EPDM roofs
 - ✓ Rubber roofs
 - ✓ Sarnafil roofs

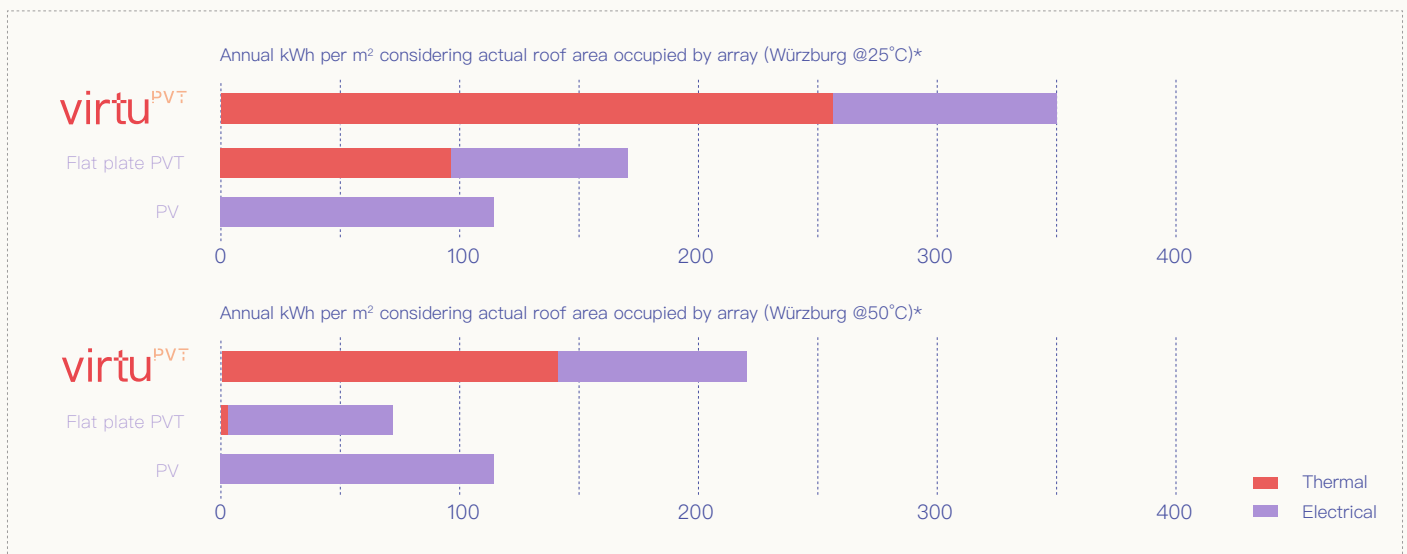
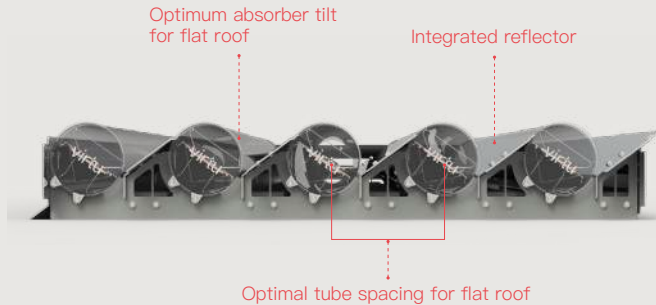


Solar
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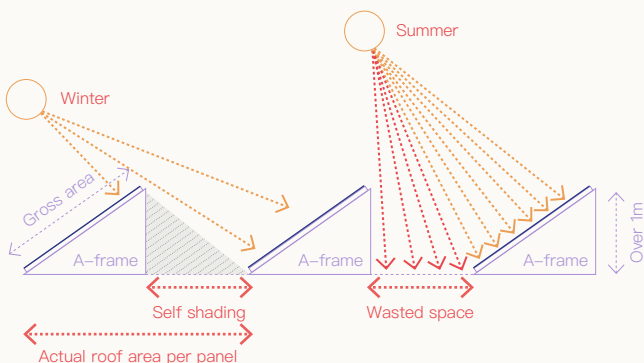
Flat roof performance

Virtu^{PVT} maximises energy density on a flat roof



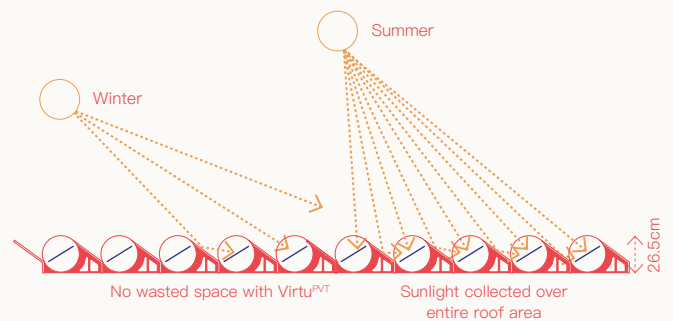
Standard panels waste space

- > Panels/collectors tilted towards the sun on A-frames
- > Spaced to avoid self shading in winter
- > Roof area required is larger than panel gross area



No wasted space with Virtu^{PVT}

- > Absorber plates are tilted to optimum angle within tubes
- > Integrated reflector captures sunlight in space between tubes
- > More energy, less space



Not to scale. Virtu stands at 26.5 cm high, compared to over 1m for tilted flat panel

*Chart notes

- > All annual kWh values are calculated using industry-standard Scenocalc and PVGIS tools, taking Würzburg as location and 0° azimuth.
- > Virtu^{PVT} kWh calculation takes parameters derived from certification pre-testing at TÜV Rheinland. Calculation is made at 0° inclination. Service corridor allowance is considered in roof area calculation (see layout on page 6).
- > Flat plate PVT kWh are taken from the Solar Keymark datasheet of a market leading PVT product. Similar results are achieved by other best-in-class panels. The flat plate PVT panel is at 35° inclination as per the datasheet. kWh / m² gross area is converted to kWh / m² roof area by considering the space between panels, which is calculated using the Technical Guide – Solar Thermal Systems (page 47) at 35° inclination.
- > PV kWh are taken from PVGIS, using Würzburg as location. Panel slope is 15°. System losses are not considered. A panel area of 2m² and a panel peak power of 390 W is assumed. The roof space occupied by a panel is calculated using the Technical Guide – Solar Thermal Systems (page 47) at 15° inclination.

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Includes integrated reflector. Suitable for:

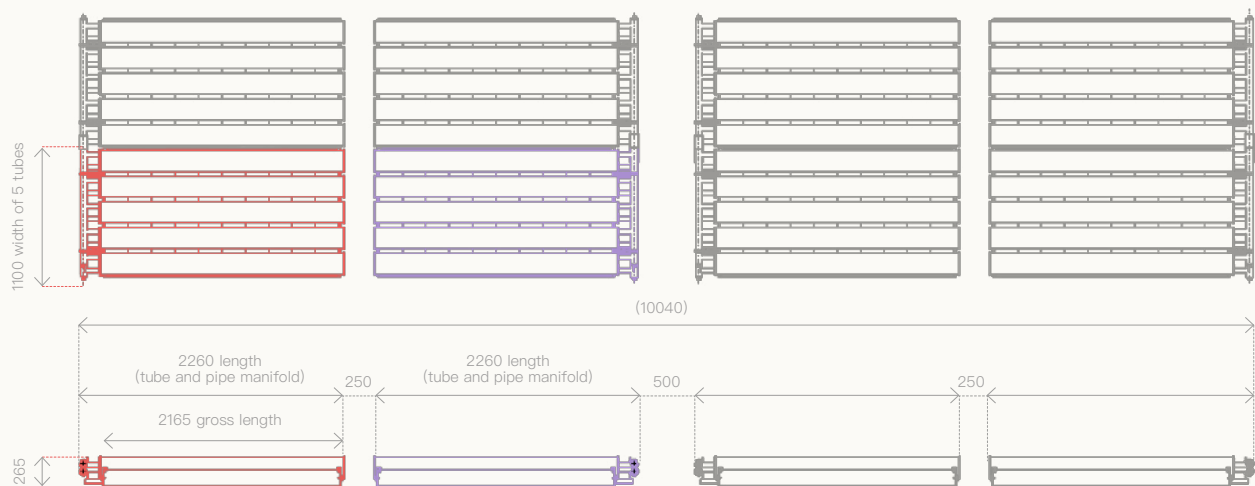
- > Flat roofs
- > Vertical façades
- > Low pitch roofs (< 15° tilt)
- > Installed in sets of 5 tubes
- > Sets connected together to form an array of any size
- > Can be configured with manifolds on **left** or **right** side

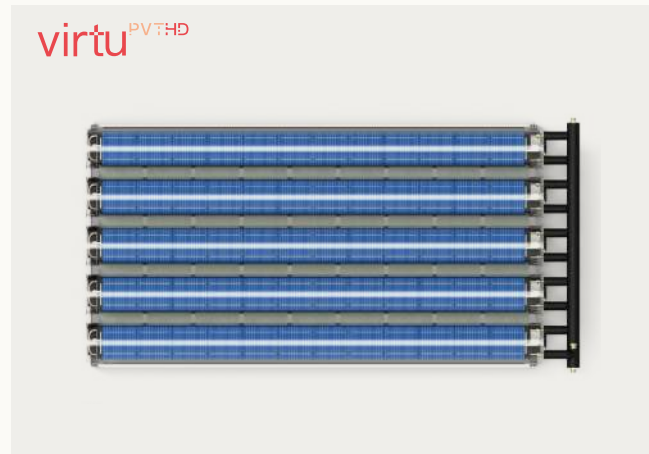
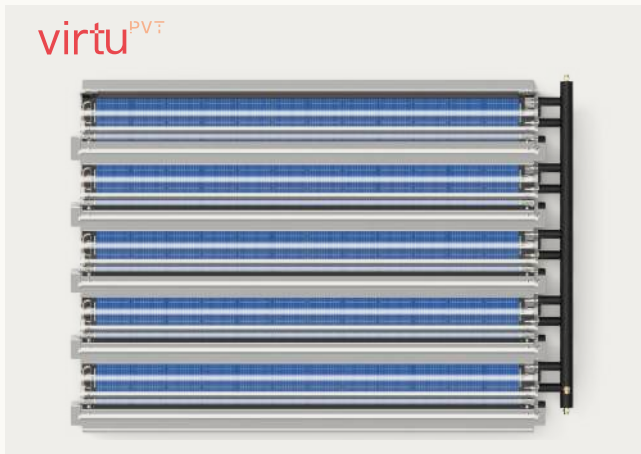


virtu^{PVTHD}

Higher density tubes without reflector. Suitable for:

- > Pitched roofs
- > Flat roofs in very low latitudes (< 30° from equator)
- > Installed in sets of 5 tubes
- > Sets connected together to form an array of any size
- > Can be configured with manifolds on **left** or **right** side





Model	Virtu ^{PVT}	Virtu ^{PVT HD}
SINGLE TUBE DIMENSIONS (refer to drawing on previous page)		
Gross length	2165 mm	2165 mm
Gross width (single tube)	300 mm	220 mm
Gross height	265 mm	265 mm
Absorber area	0.324 m ²	0.324 m ²
Aperture area	0.64 m ²	0.36 m ²
Gross area	0.65 m ²	0.47 m ²
Roof area occupied (incl. pipe manifold and service corridor)	0.78 m ²	0.57 m ²
Total weight (wet)	19.9 kg	15.6 kg
Roof loading	25.1 kg/m ²	27.37 kg/m ²
Additional ballast	Up to 21.7 kg (7 x 3.1 kg) of ballast blocks can be added per tube. Choose additional ballast based on wind loading calculations.	
Absorber plate angle	35°	Adjustable: 20°, 0° or -20°
SET OF 5 CONNECTED TUBES DIMENSIONS (refer to drawing on previous page)		
Gross width	1500 mm	1100 mm

MATERIALS	
PV cells	6" PERC monocrystalline
Absorber plate	Aluminium/copper
Glass	Borosilicate 3.3
Frame	Aluminium

SINGLE TUBE ENERGY OUTPUT		
Peak thermal output 1	275 W	215 W
Peak electrical output 1	70 W	55 W

OPERATING CONDITIONS	
Flow rate range	0.1–1 l/min
Maximum pressure	6 bar
Fluid output temperature range	10 – 80 (°C)
Heat transfer fluid	Water–Glycol Solution
Fluid volume (single tube)	150 ml
Fluid volume (set of 5 tubes with manifolds)	1.7 l
Manifold diameter (external)	22 mm
Manifold connections	DN16 male (3/4" flat face threaded)
Mounting slots	4 x M8 slots per set of 5 tubes

Predicted Annual performance in Solar Keymark standard locations.

Fluid temperature	ATHENS			DAVOS			STOCKHOLM			WÜRZBURG		
	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C

Flat roof (0° inclination) – Virtu^{PVT}

Thermal kWh per tube	362	217	106	238	132	59	177	92	37	203	107	47
kWh per m ² gross area	556	334	164	366	203	91	272	141	57	312	165	73
Thermal Annual efficiency (%)	23%	14%	7%	27%	15%	7%	28%	14%	6%	28%	15%	7%
Electrical kWh per tube	103	94	86	91	83	76	63	58	52	70	64	58
Electrical kWh per m ² gross area	158	145	132	140	128	116	97	89	81	108	99	90
Electrical Annual efficiency (%)	6%	6%	5%	10%	10%	9%	10%	9%	8%	10%	9%	8%

Pitched roof (15° – 45° degree inclination, south facing) – Virtu^{PVT HD}

Thermal kWh per tube	316	162	54	217	101	26	164	71	18	181	77	20
kWh per m ² gross area	672	344	115	461	215	54	349	151	39	386	164	43
Thermal Annual efficiency (%)	18%	9%	3%	29%	13%	3%	31%	13%	3%	31%	13%	3%
Electrical kWh per tube	91	83	76	88	81	74	62	57	52	67	61	56
Electrical kWh per m ² gross area	193	177	161	188	173	157	133	122	111	142	130	118
Electrical Annual efficiency (%)	5%	5%	4%	12%	11%	10%	12%	11%	10%	11%	11%	10%

Vertical Façade (90° degree inclination, south facing) – Virtu^{PVT}

Thermal kWh per tube	250	124	47	220	124	52	162	84	32	161	78	28
kWh per m ² gross area	384	190	73	339	191	80	250	129	50	248	120	43
Thermal Annual efficiency (%)	23%	11%	4%	28%	16%	7%	29%	15%	6%	29%	14%	5%
Electrical kWh per tube	72	66	60	84	77	70	59	54	49	58	53	48
Electrical kWh per m ² gross area	111	102	93	130	119	108	90	83	76	89	82	74
Electrical Annual efficiency (%)	7%	6%	5%	11%	10%	9%	10%	10%	9%	10%	9%	9%

Guide to calculations for building regulations / compliance, for example SBEM, FSAP, LEED.

SBEM calculations should take the predicted values according to EN 12975–2 (table below). Tilt should be set to the roof inclination.

	virtu ^{PVT}	virtu ^{PVT HD}
Area	0.65 m ² per tube	0.47 m ² per tube
Zero-loss efficiency (η ₀)	0.39	0.56
First-order coefficient (a ₁)	1.3 W/(m ² K)	2.06 W/(m ² K)
Second-order coefficient (a ₂)	0.006 W/(m ² K ²)	0.007 W/(m ² K ²)
Incidence angle modifier (IAM)	1.8	1.46

FSAP calculations should take a corrected zero-loss efficiency to account for the fact that Virtu^{PVT} has been tested at a solar incidence angle that is not perpendicular to the absorber (table below). Corrected zero-loss efficiency has been calculated as η₀ x IAM (35) x cos(35) for Virtu^{PVT}, and η₀ x IAM (20) x cos(20) for Virtu^{PVT HD}. Tilt should be set to 35° for flat roofs, the roof inclination for pitched roofs, and 55° for vertical façades.

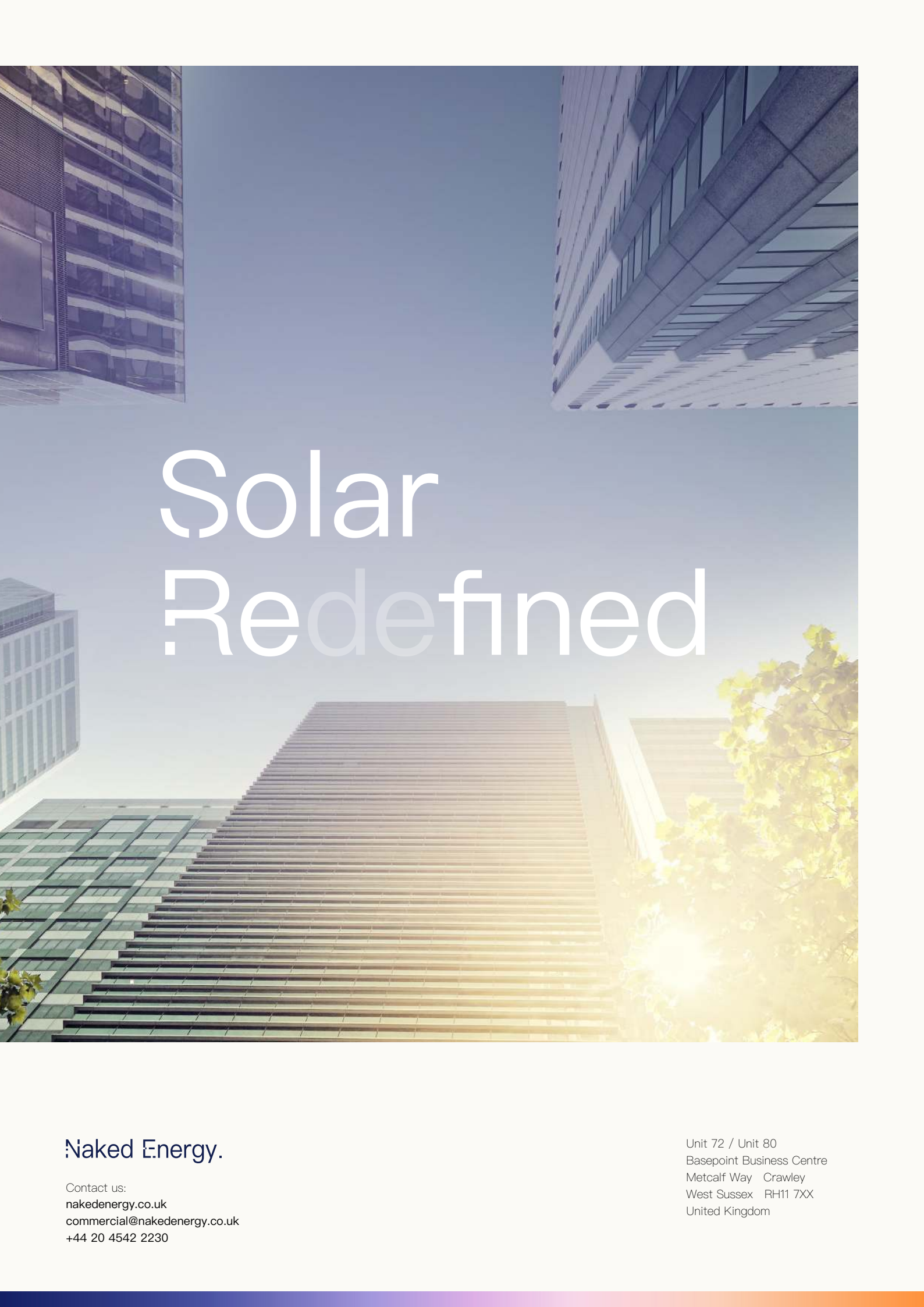
	virtu ^{PVT}	virtu ^{PVT HD}
Area	0.65 m ² per tube	0.47 m ² per tube
Zero-loss efficiency (η ₀)	0.582	0.605
First-order coefficient (a ₁)	1.3 W/(m ² K)	2.06 W/(m ² K)

Guide to inputting Virtu^{PVT} into simulation software, e.g. Tsol, EnergyPro, Scenalc.

When using more sophisticated simulation software, be sure to use the full parameter set from the datasheets **Virtu^{PVT}** or **Virtu^{PVT HD}**, and take the full IAM into account. The collector tilt should be set to the roof inclination. For vertical façades, the collector is rotated through 180 degrees.

Table notes

1. Calculated using industry-standard Scenalc tool, taking input parameters from Virtu^{PVT} laboratory tests.
2. Calculated using industry-standard Scenalc tool, taking input parameters from Virtu^{PVT} laboratory tests, IAMs are inverted to account for collector orientation.



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