virtu PVT

More energy, less space

VirtuPVT Specification Sheet 2021_v1.2

Naked Energy.

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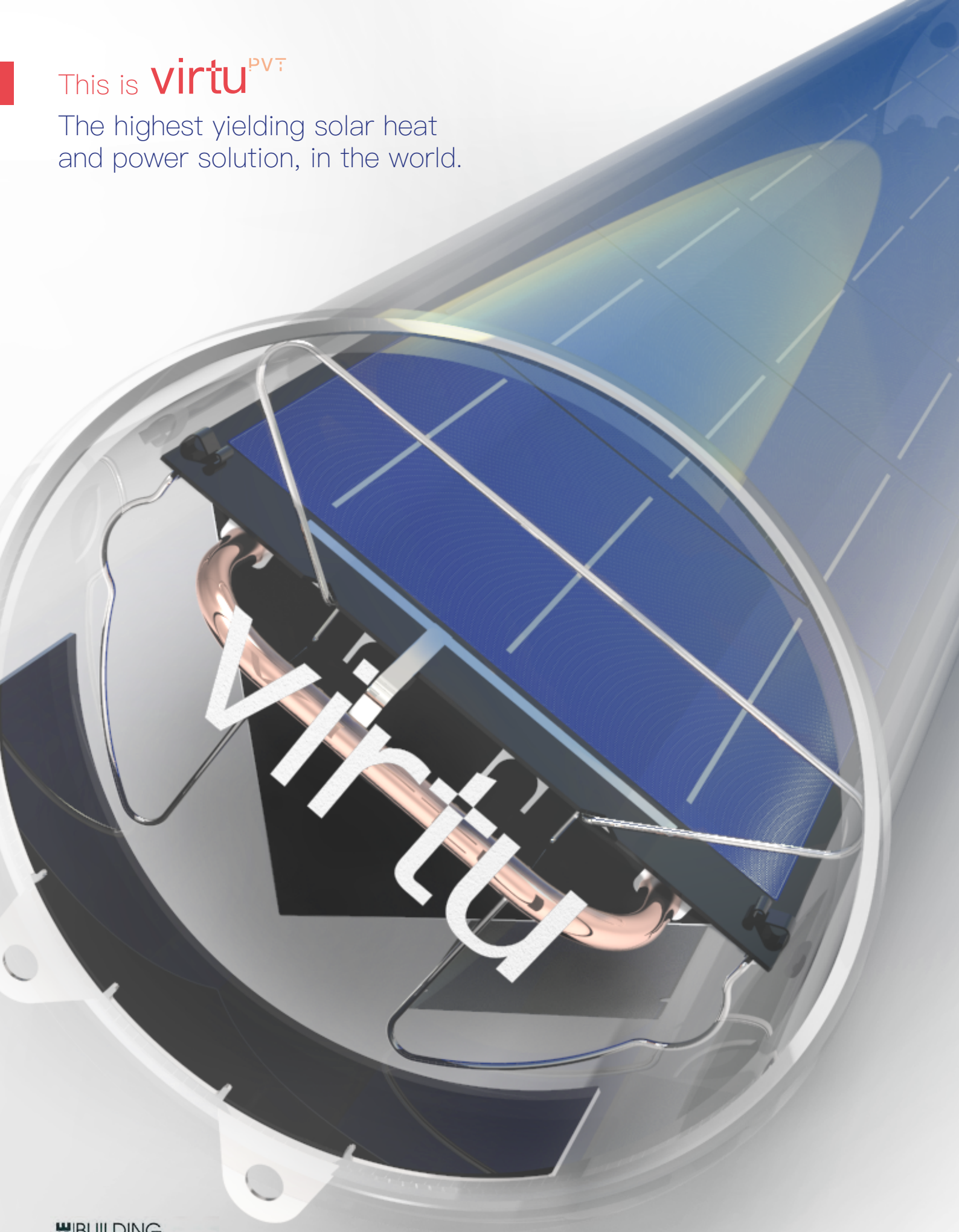
This is virtu PVT

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



CIBSE BUILDING PERFORMANCE AWARDS 2021
Winner

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

> Eligble for many Government backed subsidies

> Fully funded option available. Just pay for the energy you use

Lower install and maintenance costs

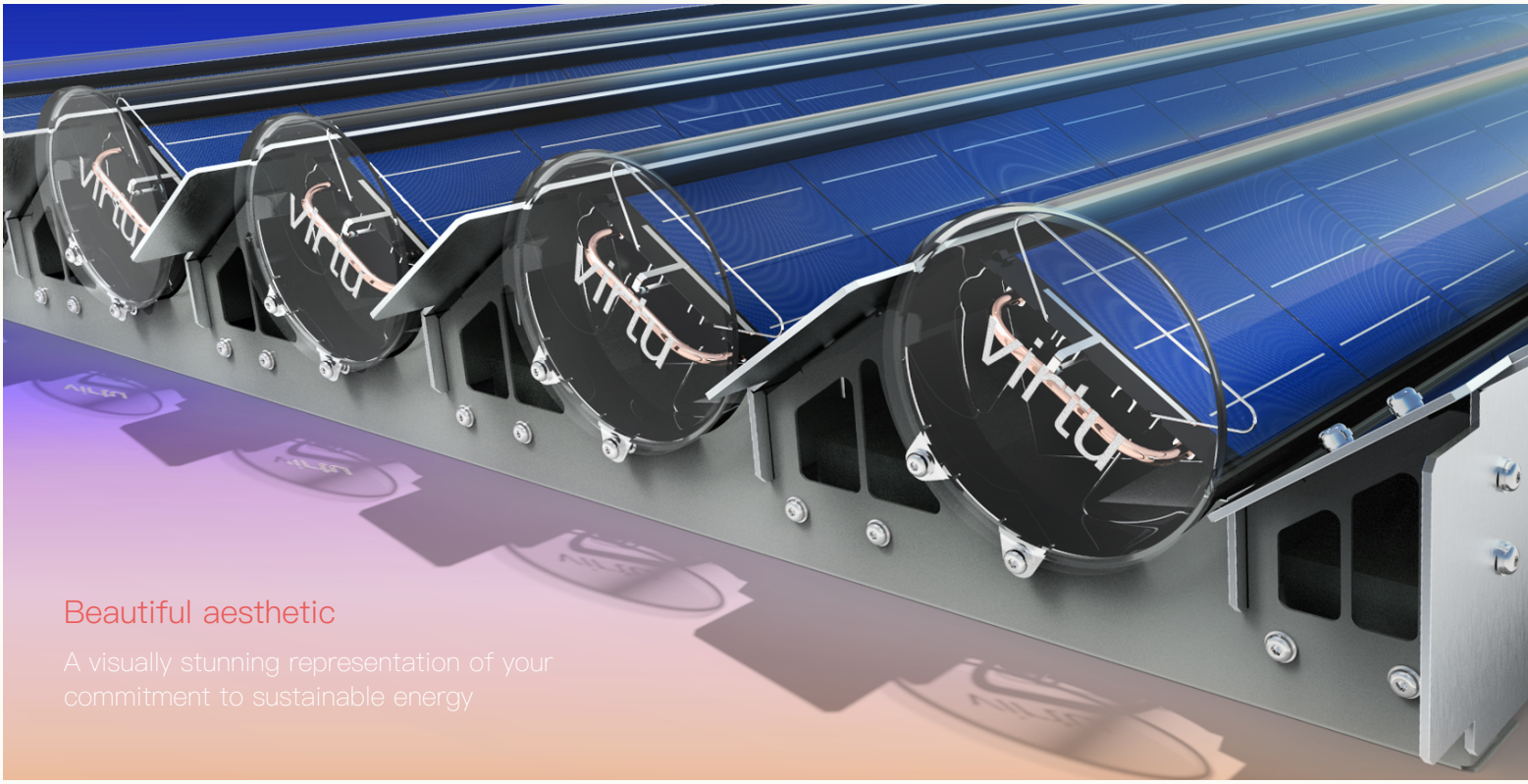
A design–led architecture and turnkey solution makes Virtu PVT easy to install

> 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



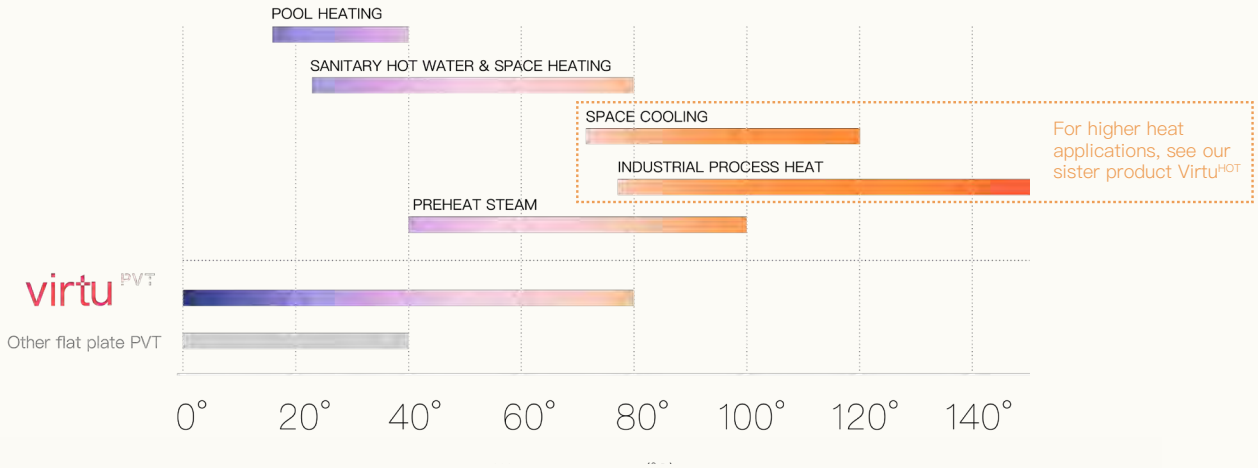
Beautiful aesthetic

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:

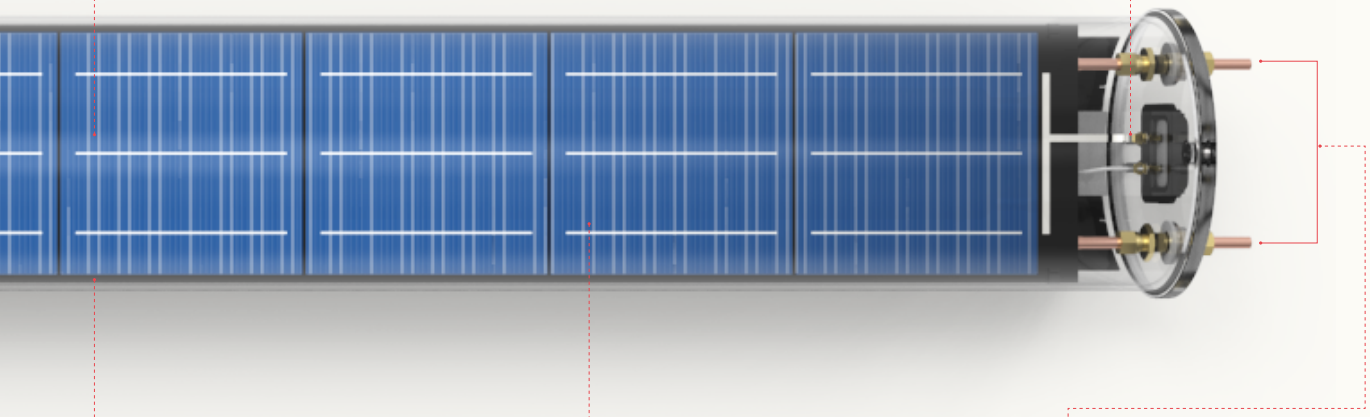


Photovoltaic cells

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

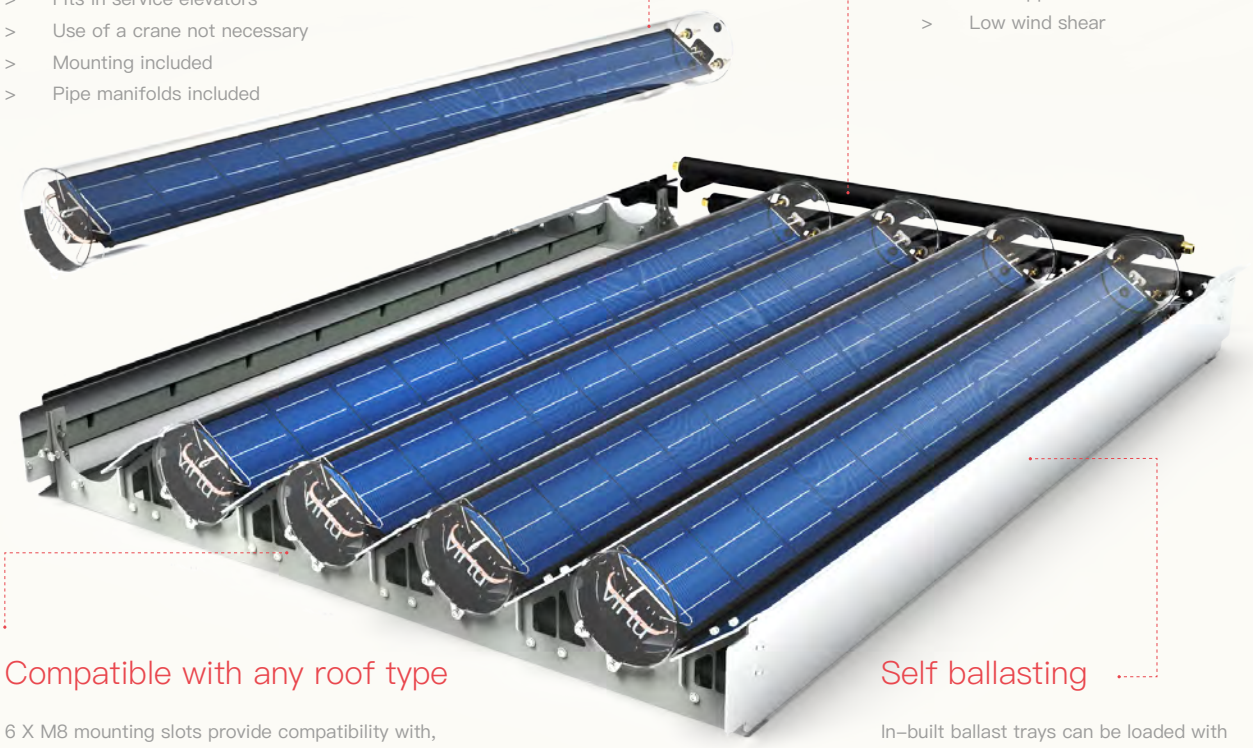
8mm pipes connect to a 22 mm manifold with DN16 connectors, which can be plumbed into the building using standard solar thermal pipework.

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/ local approval
- 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

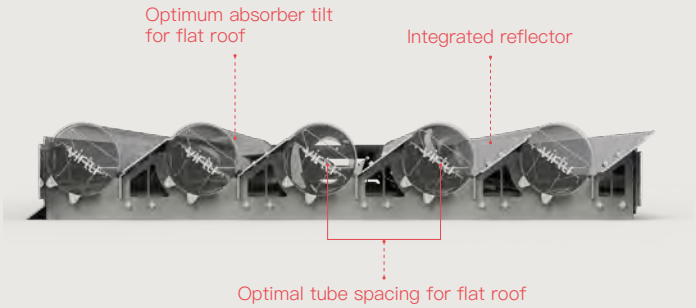
- No need for roof penetration
- No need for additional mounting
- Suitable for:
  - ✓ Felt roofs
  - ✓ EPDM roofs
  - ✓ Rubber roofs
  - ✓ Sarnafil roofs

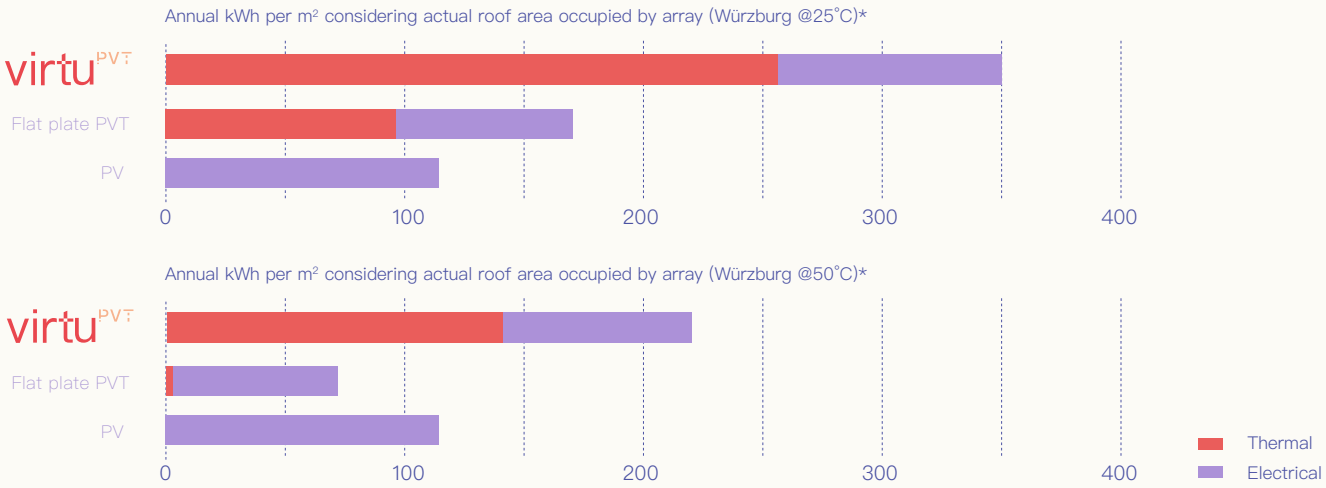
Solar Redefined

virtu

Flat roof performance

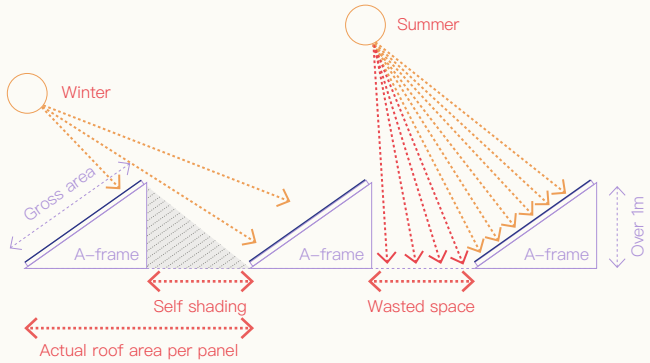
Virtu PVT maximises energy density on a flat roof





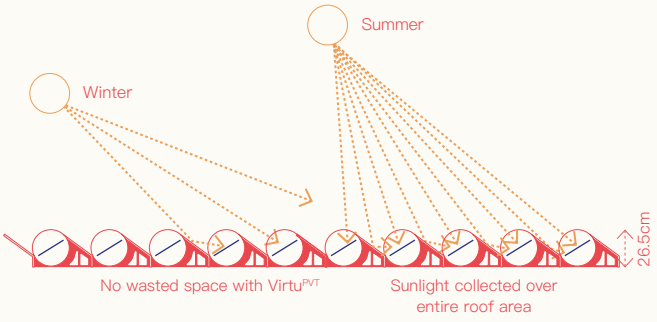
Standard panels waste space

- 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

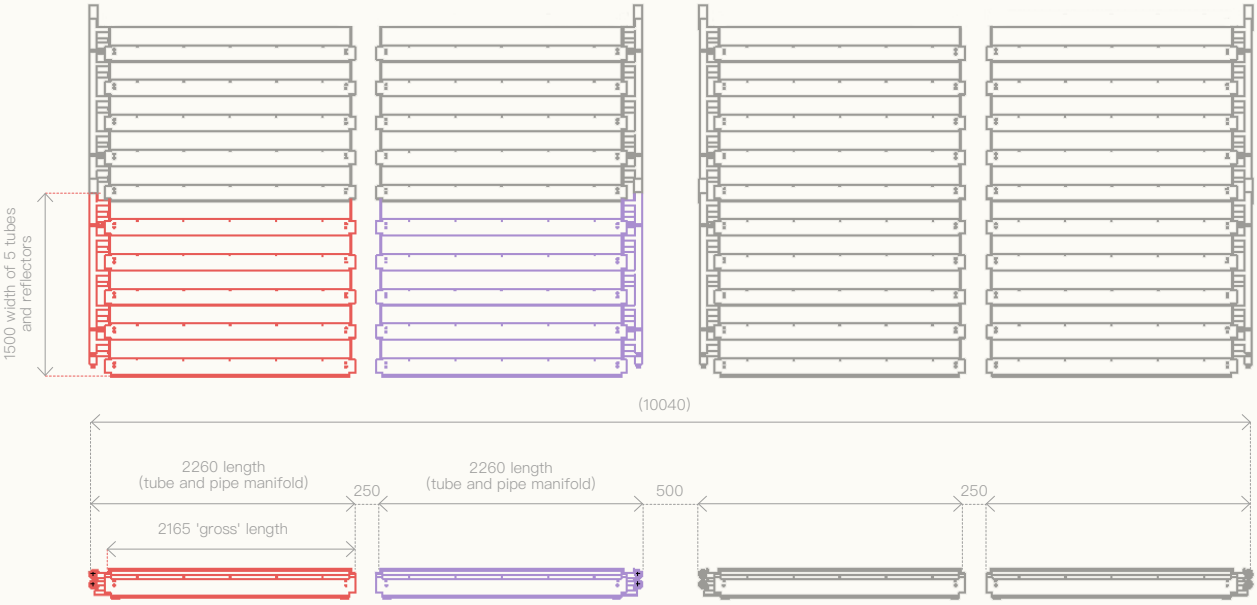
*Chart notes

- 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 TUV 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.

virtu PVT

Includes integrated reflector. Suitable for:

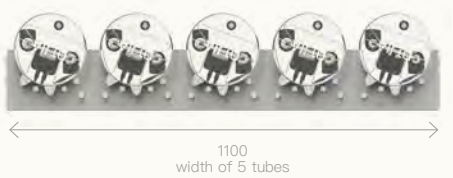
- Flat roofs
- Vertical façades
- Low pitch roofs (< 15° tilt)
- Installed in sets of 5 tubes
- Sets connected together to form an array of any size
- Can be configured with manifolds on **left** or **right** side

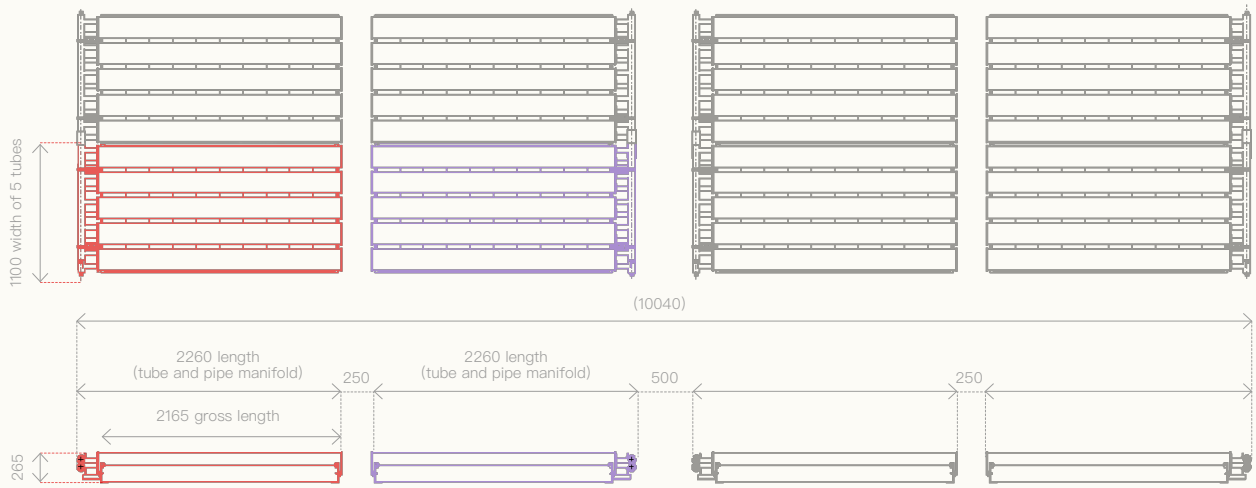


virtu PVT HD

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





virtu^{PVT}

virtu$^{PVT HD}$

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	0.331 m²	0.331 m²
Aperture area	0.64 m²	0.36 m²
Gross area	0.65 m²	0.47 m²
Roof area occupied (incl. pipe manifold and service corridor)	0.75 m²	0.55 m²
Total wet weight (unballasted)	20.9 kg	17.1 kg
Average roof loading (unballasted)	27.6 kg/m²	30.9 kg/m²
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 angles	35°	Adjustable 20°, 0° or –20°
SET OF 5 CONNECTED TUBES DIMENSIONS (refer to drawing on previous page)		
Gross width	1500 mm	1100 mm

SINGLE TUBE HEAT OUTPUT (see thermal parameters on next page)		
Peak thermal output	275 W	215 W
Stagnation temperature	130 °C	130 °C

SINGLE TUBE ELECTRICAL OUTPUT		
Pmax	74 +/– 2 W	54 +/– 2 W
Voc	8.2 +/– 0.2 V	8.1 +/– 0.2 V
Isc	12.5 +/– 0.3 A	8.9 +/– 0.2 A
Temperature coefficienct of Pmax	0.31 % / °C	0.31 % / °C
Max overcurrent protection	15.6 A	11 A

MATERIALS & MOUNTING (same for Virtu^{PVT} and Virtu$^{PVT\ HD}$)	
PV cells	6" PERC monocrystalline
Absorber plate	Aluminium/copper
Pipes and manifolds	Copper
Glass	Borosilicate 3.3
Frame	Aluminium
Mounting slots	6 x M8 slots per set of 5 tubes

HYDRONIC OPERATION AND CONNECTIONS (same for Virtu^{PVT} and Virtu$^{PVT\ HD}$)	
Flow rate range	0.1–1 l/min
Maximum pressure	6 bar
Fluid outlet 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)

PRESSURE DROP PER TUBE (same for Virtu^{PVT} and Virtu$^{PVT\ HD}$)	
Flow rate (l/min)	Pressure drop (mbar)
0.1	3
0.2	6
0.4	12
0.6	19
0.8	25
1	31

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}[1]												
Thermal kWh per tube	362	217	106	238	132	59	177	92	37	203	107	47
kWh per m² gross area	556	334	164	366	203	91	272	141	57	312	165	73
Electrical kWh per tube	103	94	86	91	83	76	63	58	52	70	64	58
Electrical kWh per m2 gross area	158	145	132	140	128	116	97	89	81	108	99	90
Pitched roof (15° – 45° degree inclination, south facing) – Virtu$^{PVT\ HD}$[2]												
Thermal kWh per tube	316	162	54	217	101	26	164	71	18	181	77	20
kWh per m² gross area	672	344	115	461	215	54	349	151	39	386	164	43
Electrical kWh per tube	91	83	76	88	81	74	62	57	52	67	61	56
Electrical kWh per m2 gross area	193	177	161	188	173	157	133	122	111	142	130	118
Vertical Façade (90° degree inclination, south facing) – Virtu^{PVT}[3]												
Thermal kWh per tube	250	124	47	220	124	52	162	84	32	161	78	28
kWh per m² gross area	384	190	73	339	191	80	250	129	50	248	120	43
Electrical kWh per tube	72	66	60	84	77	70	59	54	49	58	53	48
Electrical kWh per m2 gross area	111	102	93	130	119	108	90	83	76	89	82	74

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 m² per tube	0.47 m² per tube
Zero–loss efficiency (η0)	0.26	0.38
First–order coefficient (a1)	2.37 W/(m²K)	3.75 W/(m²K)
Second–order coefficient (a2)	0.014 W/(m²K²)	0.017 W/(m²K²)
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 m² per tube	0.47 m² per tube
Zero–loss efficiency (η0)	0.379	0.409
First–order coefficient (a1)	2.37 W/(m²K)	3.75 W/(m²K)

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

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

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