



The flat roof mounting system VarioTwin is a new system, developed by SOLARDIREKT, which impresses with its variable shape and stability.

An absolute highlight of the product is the fact that it can be extended indefinitely and is only limited by the amount of space available. Thanks to the variability of the installation it can be positioned without gaps between the individual elements and is therefore not susceptible to wind damage. Owing to the VarioTwin Large's design virtually all standard solar modules can be fitted horizontally. The individual elements are connected using the VarioTwin Large stacking system. The universal construction and resulting flexible installation also ensure that it is easy to determine the optimal amount of ballast required.

The side opening on the SDT VarioTwin prevents heat accumulation and subsequent reduction in efficiency of the solar panels. Additional holes drilled into the stand have a dual function allowing water to run off and cable clips to be secured.



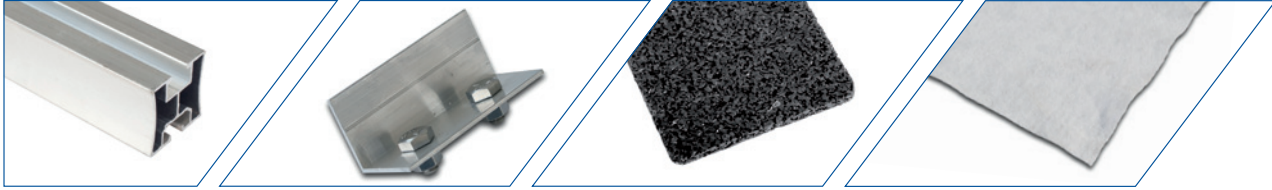
VarioTwin Large

The (r)evolution in mounting systems

- ✓ Quick and easy installation, minimal ballast requirements
- ✓ Suitable for virtually all standard solar panels
- ✓ Optimal cooling effect thanks to built-in side openings
- ✓ Installation without roof penetration
- ✓ Permits installations of any length
- ✓ HDPE material / non-conductive
- ✓ UV resistance by adding additives
- ✓ 15 years guarantee

SOLARDIREKT

Accessory components available for VarioTwin Large



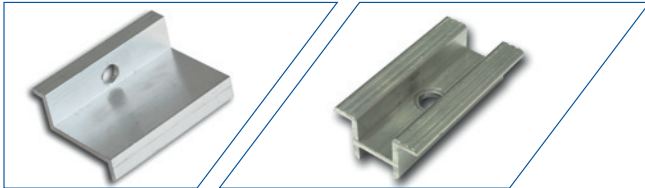
SDM Rail 40/40

SDM Rail Connector

Building Protection Mat

Separating Fleece

For attaching your solar modules



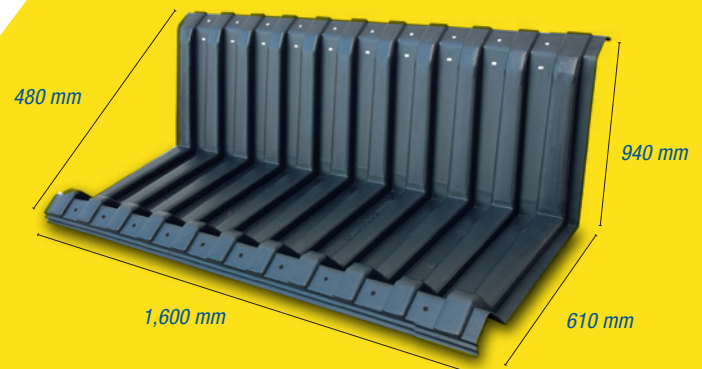
SDM Module End Clamp

for module frames
35 to 50 mm high

SDM Rail Connector

For more information on our products
go to:
www.solardirekt.com

Measurements and Weight of the VarioTwin Large 27°



Product pictures VarioTwin Large



Construction of VarioTwin Large 27° with vertical profile arrangement



Construction of VarioTwin Large 27° with horizontal profile arrangement

Measurements and Weight of the SDT VarioTwin Large 15°

Angle: 15°
Material: HDPE
Thickness: 3.7 mm
Weight: 6.06 KG
Length: 1,700 mm
Height: 261 mm
Width: 1,045 mm



Construction of VarioTwin Large 15° with horizontal profile arrangement



Determining ballast values for the VarioTwin Large

According to DIN 1055 norms, the VarioTwin Large is classified for wind loads of up to 300 m. Wind loads are measured in the form of wind pressure and wind power. The applied forces and pressures in question include wind speed, wind zone, speed of pressure, terrain, and building height. Our VarioTwin Large flat-roof mounting system is appropriate for flat roofs and shed roof constructions with a roof angle of up to 5°. To determine the standard security measures for the VarioTwin Large module carriers, the system was tested under the aerodynamic influences in a wind channel. All of the necessary static calculations and provi-

sions were confirmed according to DIN norms 1045-1, 1052-1055, 1055-100, and 18800-18808 by an independent engineering office. The results from wind channel testing and the static analysis delivered the data necessary to determine the maximum load values for the VarioTwin Large. The following materials are appropriate for ballast: gravel, pavement slabs or concrete blocks. The ballast values in the tables provided refer to the location Germany. For individual situations, SOLARDIREKT ENERGY GmbH & Co. KG recommends to conduct independent testing of building statics. We accept no liability for individual matters concerning building statics.

The values given herein refer exclusively to the materials and accessories of SOLARDIREKT ENERGY GmbH & Co. KG in this context. SDT VarioTwin Large was conceived exclusively for the use as a mounting system for photovoltaic cell modules. For every use other than the one described, SOLARDIREKT ENERGY GmbH & Co. KG accepts no liability.

Nearly every conventional solar module can be mounted using the VarioTwin Large. The mounting of the photovoltaic modules on the VarioTwin Large flat roof system is approved only for horizontal mounting and should be done by professionals.

Sample calculation for determining the required ballast load for the VarioTwin Large:

Construction of a photovoltaic system at a location in Germany, 48431 Rheine/Westphalia

Building height: (flat roof) 6.8 metres, building without attic

Module type: Standard module measuring: 808 x 1580 mm, weight of the module, 16 kg

The system will be installed in the areas H, I, F, and G of the roof.

► Calculation for roof zone H and I, first installed row of the SDT VarioTwin Large:

The location, Germany-48431 Rheine/Westphalia is located in Wind Zone 1 that means that the values for the calculation can be found in the wind load table for Wind Zone 1, first row.

The building height is 6.80 metres; the value from the height table $h < 7.00$ metres = 45.00 kg/lfdm; module weight per lfdm: $16.00 \text{ kg} : 1.58 \text{ m} = 10.13 \text{ kg/lfdm}$

The load calculation in roof zone areas H and I = $45.00 \text{ kg/lfdm} - 10.13 \text{ kg/lfdm}$ (the weight of the module) – 5.46 kg (weight of the VarioTwin Large) = 29.41 kg in the first column

VarioTwin Large is in the roof zone H and I and must therefore have a ballast value of 29.41 kg (lfdm).

► Calculation for roof zone G:

The location, Germany-48431 Rheine/Westphalia is located in Wind Zone 1 that means that the values for the calculation can be found in the wind load table for Wind Zone 1, first row (without attic).

The building height is 6.80 metres; the value from the height table $h < 7.00$ metres = 46.00 kg/lfdm; module weight per lfdm: $16.00 \text{ kg} : 1.58 \text{ m} = 10.13 \text{ kg/lfdm}$

The load calculation in roof zone area G = $46.00 \text{ kg/lfdm} - 10.13 \text{ kg/lfdm}$ (the weight of the module) – 5.46 kg (weight of the VarioTwin Large) = 30.41 kg in the first column

VarioTwin Large is in the roof zone H and I and must therefore have a ballast value of 30.41 kg (lfdm).

► Calculation for roof zone area F:

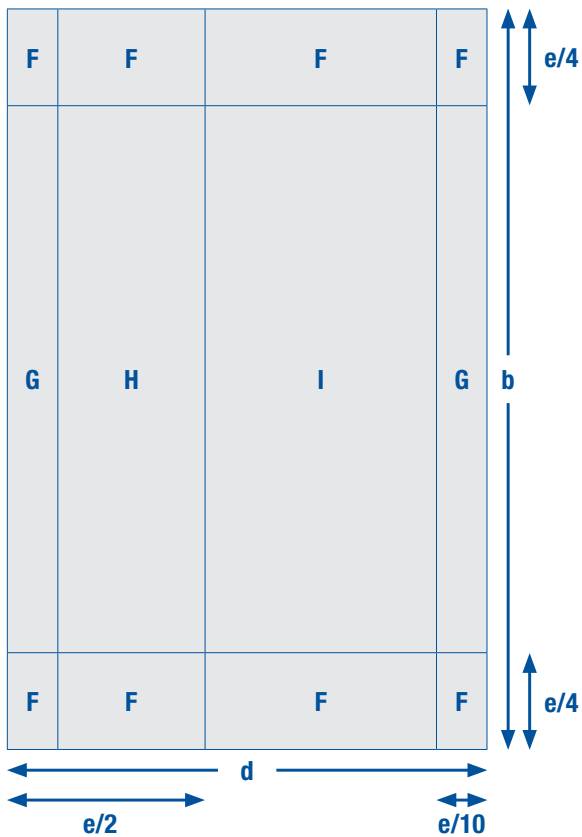
The value from the first column in the table for the wind load from Wind Zone 1 (without block-out), building height of 6.80 m = 69.00 kg/lfdm

Load calculation for roof zone area F = $69.00 \text{ kg/lfdm} - 10.13 \text{ kg/lfdm}$ (weight of the module) – 5.46 kg (weight of the VarioTwin Large) = 53.41 kg/lfdm

In the first VarioTwin Large column for roof zone area G, the ballast load must therefore be 53.41 kg/lfdm

To determine the load weights from the second mounting row, use the calculations above, but be sure to use the values from the wind load table from the second mounting row. If you have any questions or need help calculating the required load values, you can call us any time at **+49 5971-80405-0** or email us at **info@solardirekt.com**. The SOLARDIREKT Team is glad to help you.

Edge zoning distribution of the VarioTwin Large



The data required to calculate ballast requirements for roof zones H and I as well as F and G can be found in the table below.

e = building height

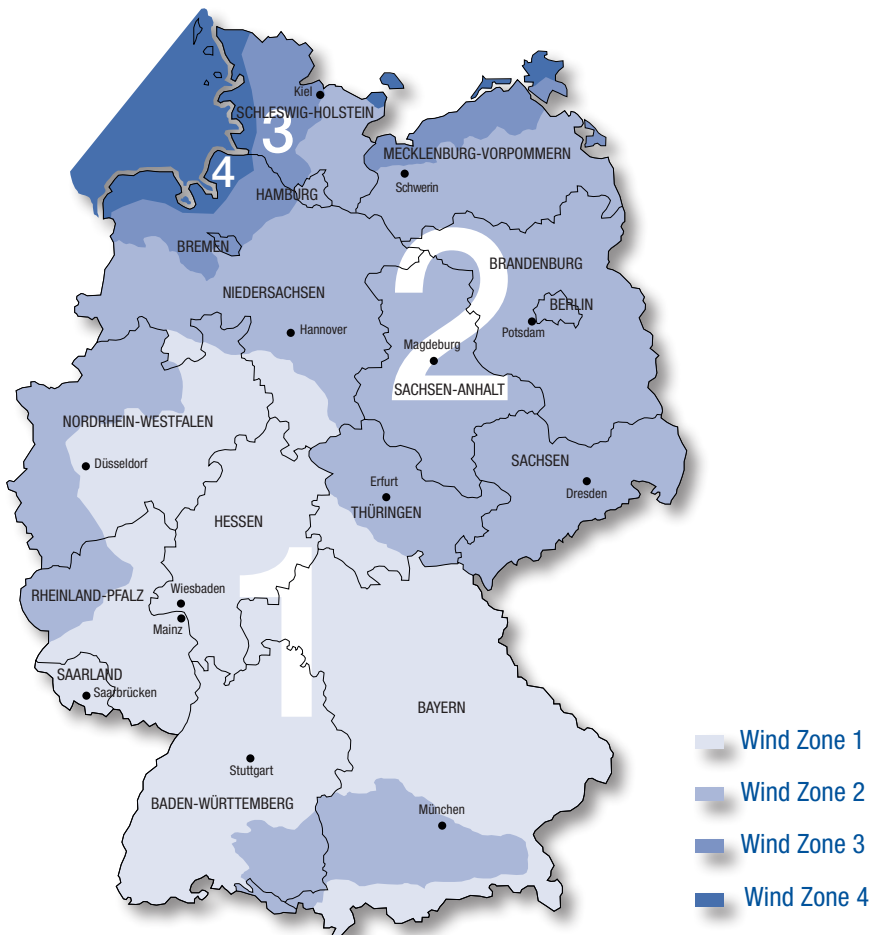
Example: building height 10m

$e = 10 \text{ m}$

$e/4 = 10 : 4 = 2,5 \text{ m}$

$e/10 = 10 : 10 = 1 \text{ m}$

Map of wind zones in Germany





Wind load tables

Wind load table Wind Zone 1

VarioTwin Large stand-up module display											First row
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic	without attic	with attic		with attic		
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤7,00 m	45,00	46,00	18 cm	43,00	35 cm	35,00	69,00	18 cm	62,00	35 cm	54,00
h≤10,00 m	51,00	52,00	25 cm	48,00	50 cm	36,00	78,00	25 cm	69,00	50 cm	61,00
h≤12,00 m	55,00	56,00	30 cm	52,00	60 cm	42,00	84,00	30 cm	74,00	60 cm	65,00
h≤15,00 m	59,00	61,00	38 cm	56,00	75 cm	46,00	91,00	38 cm	81,00	75 cm	71,00
h≤20,00 m	66,00	67,00	50 cm	62,00	100 cm	51,00	101,00	50 cm	90,00	100 cm	79,00

VarioTwin Large stand-up module display											From the second row on
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic	without attic	with attic		with attic		
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤7,00 m	28,00	46,00	18 cm	43,00	35 cm	35,00	69,00	18 cm	62,00	35 cm	54,00
h≤10,00 m	31,00	52,00	25 cm	48,00	50 cm	36,00	78,00	25 cm	69,00	50 cm	61,00
h≤12,00 m	33,00	56,00	30 cm	52,00	60 cm	42,00	84,00	30 cm	74,00	60 cm	65,00
h≤15,00 m	36,00	61,00	38 cm	56,00	75 cm	46,00	91,00	38 cm	81,00	75 cm	71,00
h≤20,00 m	40,00	67,00	50 cm	62,00	100 cm	51,00	101,00	50 cm	90,00	100 cm	79,00

Wind load table Wind Zone 2

VarioTwin Large stand-up module display											First row
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic	without attic	with attic		with attic		
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤7,00 m	55,00	57,00	18 cm	52,00	35 cm	43,00	85,00	18 cm	75,00	35 cm	67,00
h≤10,00 m	62,00	63,00	25 cm	59,00	50 cm	48,00	95,00	25 cm	85,00	50 cm	74,00
h≤12,00 m	67,00	68,00	30 cm	63,00	60 cm	51,00	102,00	30 cm	91,00	60 cm	80,00
h≤15,00 m	72,00	74,00	38 cm	68,00	75 cm	55,00	111,00	38 cm	99,00	75 cm	86,00
h≤20,00 m	81,00	82,00	50 cm	76,00	100 cm	52,00	124,00	50 cm	111,00	100 cm	96,00

VarioTwin Large stand-up module display											From the second row on
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic	without attic	with attic		with attic		
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤7,00 m	34,00	57,00	18 cm	52,00	35 cm	43,00	85,00	18 cm	75,00	35 cm	67,00
h≤10,00 m	37,00	63,00	25 cm	59,00	50 cm	48,00	95,00	25 cm	85,00	50 cm	74,00
h≤12,00 m	40,00	68,00	30 cm	63,00	60 cm	51,00	102,00	30 cm	91,00	60 cm	80,00
h≤15,00 m	44,00	74,00	38 cm	68,00	75 cm	55,00	111,00	38 cm	99,00	75 cm	86,00
h≤20,00 m	49,00	82,00	50 cm	76,00	100 cm	52,00	124,00	50 cm	111,00	100 cm	96,00

Wind load table Wind Zone 3

Inland

VarioTwin Large stand-up module display											First row
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h ≤ 7,00 m	67,00	68,00	18 cm	63,00	35 cm	51,00	102,00	18 cm	91,00	35 cm	79,00
h ≤ 10,00 m	75,00	77,00	25 cm	71,00	50 cm	58,00	115,00	25 cm	103,00	50 cm	90,00
h ≤ 12,00 m	80,00	82,00	30 cm	75,00	60 cm	62,00	122,00	30 cm	109,00	60 cm	95,00
h ≤ 15,00 m	87,00	90,00	38 cm	82,00	75 cm	67,00	134,00	38 cm	119,00	75 cm	104,00
h ≤ 20,00 m	97,00	99,00	50 cm	91,00	100 cm	75,00	148,00	50 cm	132,00	100 cm	115,00

Inland

VarioTwin Large stand-up module display											From the second row on
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h ≤ 7,00 m	40,00	68,00	18 cm	63,00	35 cm	51,00	102,00	18 cm	91,00	35 cm	79,00
h ≤ 10,00 m	45,00	77,00	25 cm	71,00	50 cm	58,00	115,00	25 cm	103,00	50 cm	90,00
h ≤ 12,00 m	48,00	82,00	30 cm	75,00	60 cm	62,00	122,00	30 cm	109,00	60 cm	95,00
h ≤ 15,00 m	52,00	90,00	38 cm	82,00	75 cm	67,00	134,00	38 cm	119,00	75 cm	104,00
h ≤ 20,00 m	58,00	99,00	50 cm	91,00	100 cm	75,00	148,00	50 cm	132,00	100 cm	115,00

Wind load table Wind Zone 3

Coastal regions or Baltic Islands

VarioTwin Large stand-up module display											First row
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h ≤ 4,00 m	80,00	82,00	10 cm	75,00	20 cm	62,00	122,00	10 cm	109,00	20 cm	95,00
h ≤ 7,00 m	92,00	94,00	18 cm	87,00	35 cm	71,00	141,00	18 cm	126,00	35 cm	110,00
h ≤ 10,00 m	101,00	104,00	25 cm	95,00	50 cm	78,00	156,00	25 cm	138,00	50 cm	121,00
h ≤ 12,00 m	107,00	109,00	30 cm	100,00	60 cm	82,00	164,00	30 cm	146,00	60 cm	128,00
h ≤ 15,00 m	113,00	116,00	38 cm	107,00	75 cm	87,00	174,00	38 cm	155,00	75 cm	136,00
h ≤ 20,00 m	122,00	125,00	50 cm	115,00	100 cm	94,00	187,00	50 cm	167,00	100 cm	146,00

Coastal regions or Baltic Islands

VarioTwin Large stand-up module display											From the second row on
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h ≤ 4,00 m	48,00	82,00	10 cm	75,00	20 cm	62,00	122,00	10 cm	109,00	20 cm	95,00
h ≤ 7,00 m	55,00	94,00	18 cm	87,00	35 cm	71,00	141,00	18 cm	126,00	35 cm	110,00
h ≤ 10,00 m	62,00	104,00	25 cm	95,00	50 cm	78,00	156,00	25 cm	138,00	50 cm	121,00
h ≤ 12,00 m	64,00	109,00	30 cm	100,00	60 cm	82,00	164,00	30 cm	146,00	60 cm	128,00
h ≤ 15,00 m	68,00	116,00	38 cm	107,00	75 cm	87,00	174,00	38 cm	155,00	75 cm	136,00
h ≤ 20,00 m	73,00	125,00	50 cm	115,00	100 cm	94,00	187,00	50 cm	167,00	100 cm	146,00



Wind load table Wind Zone 4

Coastal areas

VarioTwin Large stand-up module display											First row
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤4,00 m	94,00	96,00	10 cm	88,00	20 cm	72,00	182,00	10 cm	161,00	20 cm	141,00
h≤7,00 m	110,00	112,00	18 cm	103,00	35 cm	84,00	202,00	18 cm	179,00	35 cm	157,00
h≤10,00 m	121,00	124,00	25 cm	114,00	50 cm	93,00	216,00	25 cm	192,00	50 cm	168,00
h≤12,00 m	127,00	130,00	30 cm	119,00	60 cm	98,00	223,00	30 cm	198,00	60 cm	174,00
h≤15,00 m	135,00	139,00	38 cm	127,00	75 cm	104,00	234,00	38 cm	207,00	75 cm	182,00
h≤20,00 m	145,00	149,00	50 cm	137,00	100 cm	112,00	247,00	50 cm	219,00	100 cm	192,00

Coastal areas

VarioTwin Large stand-up module display											From the second row on
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤4,00 m	56,00	96,00	10 cm	88,00	20 cm	72,00	182,00	10 cm	161,00	20 cm	141,00
h≤7,00 m	66,00	112,00	18 cm	103,00	35 cm	84,00	202,00	18 cm	179,00	35 cm	157,00
h≤10,00 m	72,00	124,00	25 cm	114,00	50 cm	93,00	216,00	25 cm	192,00	50 cm	168,00
h≤12,00 m	76,00	130,00	30 cm	119,00	60 cm	98,00	223,00	30 cm	198,00	60 cm	174,00
h≤15,00 m	80,00	139,00	38 cm	127,00	75 cm	104,00	234,00	38 cm	207,00	75 cm	182,00
h≤20,00 m	87,00	149,00	50 cm	137,00	100 cm	112,00	247,00	50 cm	219,00	100 cm	192,00

Wind load table Wind Zone 4

North Sea Islands

VarioTwin Large stand-up module display											First row
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤4,00 m	118,00	121,00	10 cm	111,00	20 cm	91,00	182,00	10 cm	161,00	20 cm	141,00
h≤7,00 m	131,00	134,00	18 cm	123,00	35 cm	101,00	202,00	18 cm	179,00	35 cm	157,00
h≤10,00 m	141,00	144,00	25 cm	132,00	50 cm	108,00	216,00	25 cm	192,00	50 cm	168,00
h≤12,00 m	145,00	149,00	30 cm	137,00	60 cm	112,00	223,00	30 cm	198,00	60 cm	174,00
h≤15,00 m	152,00	156,00	38 cm	143,00	75 cm	117,00	234,00	38 cm	207,00	75 cm	182,00
h≤20,00 m	160,00	164,00	50 cm	151,00	100 cm	123,00	247,00	50 cm	219,00	100 cm	192,00

North Sea Islands

VarioTwin Large stand-up module display											From the second row on
	Areas H and I	Area G					Area F				
		without attic	with attic		with attic		without attic	with attic		with attic	
Building height	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm	kg/lfdm	height A	kg/lfdm	height A	kg/lfdm
h≤4,00 m	70,00	121,00	10 cm	111,00	20 cm	91,00	182,00	10 cm	161,00	20 cm	141,00
h≤7,00 m	78,00	134,00	18 cm	123,00	35 cm	101,00	202,00	18 cm	179,00	35 cm	157,00
h≤10,00 m	84,00	144,00	25 cm	132,00	50 cm	108,00	216,00	25 cm	192,00	50 cm	168,00
h≤12,00 m	87,00	149,00	30 cm	137,00	60 cm	112,00	223,00	30 cm	198,00	60 cm	174,00
h≤15,00 m	90,00	156,00	38 cm	143,00	75 cm	117,00	234,00	38 cm	207,00	75 cm	182,00
h≤20,00 m	96,00	164,00	50 cm	151,00	100 cm	123,00	247,00	50 cm	219,00	100 cm	192,00

SOLARDIREKT



SOLARDIREKT ENERGY GmbH & Co. KG
Landersumer Weg 40
D-48431 Rheine

Fon: +49 5971 804 05-0
Fax: +49 5971 804 05-29

info@solardirekt.com
www.solardirekt.com

