

## Hoval UltraSol® 2

*Flat collector*

- High-performance flat collector, glazed, for thermal utilisation of solar energy
- Vertical and horizontal design
- For surface-mounted, flat roof or in-roof installation
- Stable frame made of aluminium extruded sections
- Structured toughened safety glass (ESG) with anti-reflective coating on one side
- Aluminium full-surface absorber with highly-selective coating
- Serpentine manifold made of copper with 4 connections
- Collector connections and connectors with compression fitting
- Thermal insulation made of mineral wool (20 mm)
- High annual yield (Würzburg 50 °C) 1055 kWh/collector

*Delivery UltraSol®, UltraSol® eco*

- *max. 10 pcs. upright on each pallet*

### Installation sets

- On-roof installation parallel and elevated (0°, 20°, 30°, 45°) vertical and horizontal consisting of:
  - substructure and hydraulic roof connection
 Substructure suitable for the following roof connections:
  - interlocking tile
  - plain tile
  - slate, Eternit
  - tin roof clamp
  - hanger bolts
  - on-site roof connection with quick-mount adapter
- Flat roof mounting with concrete base 45°
  - for horizontal collectors
- Roof inlay mounting
  - for vertical and horizontal collectors

### Solar cable SL

- Stainless steel corrugated tube for solar heating circuits, material 1.4404.
- Low-noise, pressure-resistant and diffusion-tight.
- Pipe insulation made of synthetic rubber, CFC-free.
- Silicone cable for temperature sensor integrated.
- Weatherproof, UV-stable and PVC-free protective sleeve.
- Pipe system for endless laying, for quick and easy installation.

*Delivery*

Solar cables completely packed.



### Certifications

<i>Hoval UltraSol® 2</i>	<i>Solar Keymark 011-7S2954 F</i>
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### Model range

UltraSol® 2 Type	Installation	Gross collector surface area m <sup>2</sup>	Absorber surface area/ Aperture surface m <sup>2</sup>
UltraSol® 2 V	vertical	2,53	2,33
UltraSol® 2 H	horizontal	2,53	2,33

### Connection set

- Connection set for connecting the Hoval UltraSol® and UltraSol® eco flat collectors to a solar fitting group ¾" using solar cables (e.g. SAG20).
- Connection screw fittings matching R ¾"/ Rp ¾".

*Delivery*

Collector connection set separately packed.

Flat-panel collectors



**Hoval UltraSol®**

- High-performance flat collector for solar systems with water/glycol mixture as heat transfer medium
- Structured toughened safety glass (ESG) with anti-reflective coating on one side
- Highly-selective coated absorber
- High annual yield (Würzburg 50 °C) 1055 kWh/collector



**Flat collector - vertical installation type**

UltraSol® type	Collector surface area		Number of collectors units
	Gross m²	Absorber m²	
1V	2.53	2.33	1
2V	5.06	4.66	2
3V	7.59	6.99	3
4V	10.12	9.32	4
5V	12.65	11.65	5
6V	15.18	13.98	6
7V	17.71	16.31	7
8V	20.24	18.64	8
9V	22.77	20.97	9
10V	25.30	23.30	10

**Part No.**

- 6050 633
- 6050 634
- 6050 635
- 6050 636
- 6050 637
- 6050 638
- 6050 639
- 6050 640
- 6050 641
- 6050 642



**Flat collector - horizontal installation type**

UltraSol® eco type	Collector surface area		Number of collectors units
	Gross m²	Absorber m²	
1H	2.53	2.33	1
2H	5.06	4.66	2
3H	7.59	6.99	3
4H	10.12	9.32	4
5H	12.65	11.65	5
6H	15.18	13.98	6
7H	17.71	16.31	7
8H	20.24	18.64	8
9H	22.77	20.97	9
10H	25.30	23.30	10

- 6050 643
- 6050 644
- 6050 645
- 6050 646
- 6050 647
- 6050 648
- 6050 649
- 6050 650
- 6050 651
- 6050 652

**Installation set**

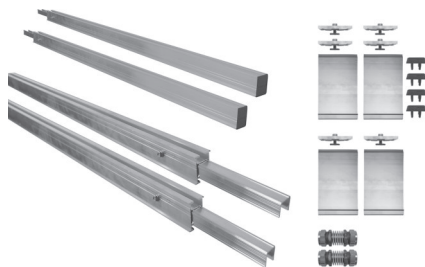
See following pages

**Installation sets for on-roof installation**  
side-by-side, vertical and horizontal 0°



On-roof installation

Metal tiles and roof bushings for concrete, clay and plain tiles see collector accessories



**Substructure and hydraulic collector connections**

(without roof connection and collector connections of collector)

**Substructure and hydraulic collector connections for on-roof mounting vertical and horizontal 0°**

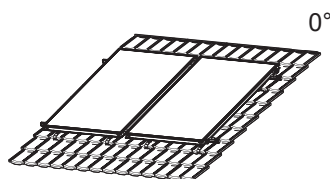
- for Hoval flat collectors UltraSol® 2 for on-roof installation parallel with the roof
- Substructure suitable for
  - interlocking tile
  - plain tile
  - slate, Eternit
  - tin roof clamp
  - hanger bolts
- Roof pitch min. 22°

Consisting of:

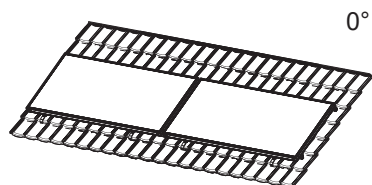
- complete fitting accessories (without roof connection and collector connections)
- hydraulic collector connectors

**Notice**

Collector connections and roof connection of collector, see following pages



for number of collectors vertical per collector field units	Installation set	
1	AD0V-1	6051 243
2	AD0V-2	6051 244
3	AD0V-3	6051 245
4	AD0V-4	6051 246
5	AD0V-5	6051 247
6	AD0V-6	6051 248
7	AD0V-7	6051 249
8	AD0V-8	6051 250



for number of collectors horizontal per collector field units	Installation set	
1	AD0H-1	6051 251
2	AD0H-2	6051 252
3	AD0H-3	6051 253
4	AD0H-4	6051 254
5	AD0H-5	6051 255
6	AD0H-6	6051 256

**Part No.**

**Installation sets for on-roof installation**  
side-by-side, vertical and horizontal 20°,30°,45°



On-roof installation

Metal tiles and roof bushings for concrete, clay and plain tiles see collector accessories

**Substructure and hydraulic collector connections**

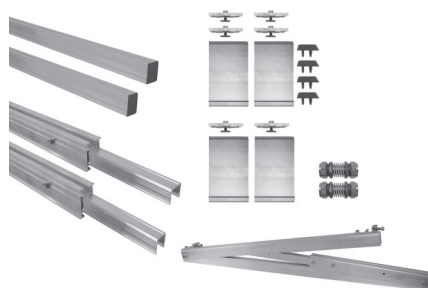
(without roof connection and collector connections of collector)

**Substructure and hydraulic collector connections for on-roof mounting vertical and horizontal 20°, 30°, 45°**

- for Hoval flat plate collectors UltraSol® 2
- for on-roof installation elevated 20°, 30°, 45° in relation to the roof
- Substructure suitable for
  - interlocking tile
  - plain tile
  - slate, Eternit
  - tin roof clamp
  - hanger bolts

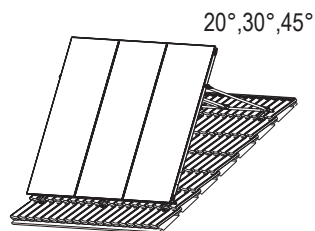
Consisting of:

- complete fitting accessories (without roof connection and collector connections)
- hydraulic collector connectors
- Adjustable elevation angle 20°, 30°, 45°
- Wind bracing



**Notice**

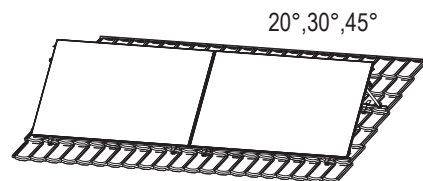
Collector connections and roof connection of collector, see following pages



for number of collectors vertical per collector field units

	Installation set
1	AD20-45V-1
2	AD20-45V-2
3	AD20-45V-3
4	AD20-45V-4
5	AD20-45V-5
6	AD20-45V-6
7	AD20-45V-7
8	AD20-45V-8

- 6051 257
- 6051 258
- 6051 259
- 6051 260
- 6051 261
- 6051 262
- 6051 263
- 6051 264



for number of collectors horizontal per collector field units

	Installation set
1	AD20-45H-1
2	AD20-45H-2
3	AD20-45H-3
4	AD20-45H-4
5	AD20-45H-5
6	AD20-45H-6

- 6051 265
- 6051 266
- 6051 267
- 6051 268
- 6051 269
- 6051 270

Elevation horizontal 60° see accessories

**Part No.**

Roof connections for on-roof installation

**Determining the number of roof connection sets**  
see chapter Engineering/Table 1 and 2



**Roof bar set adjustable tile**  
for attaching the carrier profiles for on-roof attachment of UltraSol® 2  
Consisting of:  
- 2 roof bars  
- Screw set US2-SHS

6037 731



**Roof bar set adjustable heavy duty**  
for elevated static requirements for attaching the carrier profiles for on-roof attachment of UltraSol® 2  
Consisting of:  
- 2 roof bars HD  
- Screw set US2-SHS

6037 764



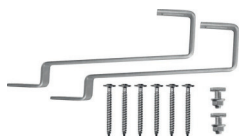
**Packing plate 2mm**  
for levelling the roof bars

2061 367



**Packing plate 3mm**  
for levelling the roof bars

2061 368



**Roof bar set plain tile**  
for attaching the carrier profiles for on-roof attachment of UltraSol® 2  
Consisting of:  
- 2 roof bars  
- Screw set US2-SHS  
- Installation set T-head bolt  
can only be used in conjunction with metal tiles.

6037 767



**Roof bar set slate / Flat Eternit**  
for attaching the carrier profiles for on-roof attachment of UltraSol® 2  
Consisting of:  
- 2 roof bars  
- Screw set US2-SHS  
- Installation set T-head bolt  
can only be used in conjunction with metal tiles.

6037 769

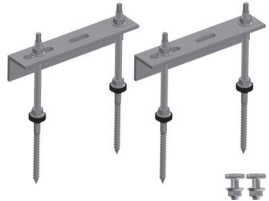


**Clamp set tin roof clamp**  
for attaching the carrier profiles for on-roof attachment of UltraSol® 2  
Consisting of:  
- 2 tin roof clamps  
- Installation set T-head bolt

6037 770



**Hanger bolt set individual**  
 for attaching the carrier profiles for  
 on-roof attachment of UltraSol® 2  
 Consisting of:  
 - 2 hanger bolts M12  
 - 2 quick-mount adapters M12 cpl.



**Double level screw set**  
 for attaching the carrier profiles for  
 on-roof attachment of UltraSol® 2  
 Consisting of:  
 - 2 double level screws US-Dss  
 - Installation set T-head bolt



**Screw set concrete base**  
 for attaching the carrier profiles for  
 on-roof attachment of UltraSol® 2  
 Consisting of:  
 - 2 threaded rod M10x150  
 - 2 quick-mount adapters M10 cpl.

**Part No.**

6037 771

6037 772

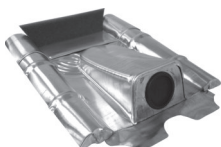
6037 775

**Metal tiles and roof bushings  
for concrete, clay and plain tiles**



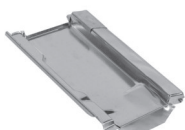
**Metal tiles, type concrete**  
for exchanging a concrete pantile  
(e.g. interlocking tile)  
galvanised version

2057 258



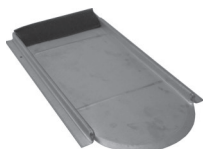
**Roof bushing, type concrete**  
for tube bushing (1 tube) through  
the roof cladding of a concrete pantile  
(e.g. interlocking tile)  
galvanised version, 2 pieces

2057 259



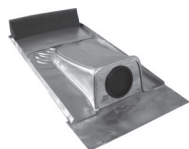
**Metal tiles, type clay 260**  
for exchanging the roof tile  
(e.g. variable-gauge tiles)  
galvanised version

2057 260



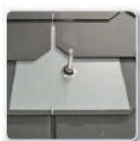
**Metal tiles, type plain**  
for exchanging the roof tile  
(e.g. plain tile)  
galvanised version

2057 262



**Roof bushing, type clay 260**  
for tube bushing (1 tube) through  
the roof cladding (e.g. variable-  
gauge tiles and plain tile)  
galvanised version, 2 pieces

2057 261



**Metal tiles, type slate**  
for protecting the roof tile  
(e.g. Eternit slabs, slate slabs)  
galvanised version

2057 264



**Roof bushing, type slate**  
for tube bushing (1 tube) through the  
roof cladding (e.g. Eternit slabs,  
slate slabs)  
galvanised version, 2 pieces

2057 265

Part No.
2057 258
2057 259
2057 260
2057 262
2057 261
2057 264
2057 265

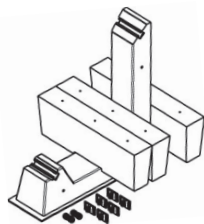
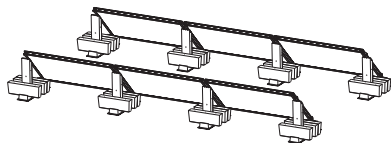
**Installation sets**

**Flat roof installation concrete base**

side-by-side, horizontal



Flat roof-mounting  
Concrete base



**Flat roof - concrete base**

**45°, horizontal**

- for Hoval flat collectors UltraSol® 2 H, UltraSol® eco H
- for flat roof installation 45°
- with concrete base

Comprising:

- Two-part concrete base (approx. 92 kg) incl. 3 additional weights (of approx. 50 kg) Total weight: 242 kg
- Protective mat with aluminium lining
- complete fitting accessories (without collector connections)
- hydraulic collector connectors

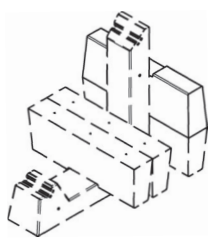
**Notice**

Collector connections, see following pages

for number  
of collectors  
per collector  
field units

Installation set

1	FDBS45H-1	6051 271
2	FDBS45H-2	6051 272
3	FDBS45H-3	6051 273
4	FDBS45H-4	6051 274
5	FDBS45H-5	6051 275
6	FDBS45H-6	6051 276
7	FDBS45H-7	6051 277
8	FDBS45H-8	6051 278



**Additional weight for concrete base**

for UltraSol® 2 H flat plate collector  
for increasing loading weight  
in areas with increased wind loads  
or on high buildings.  
incl. 3 M8 threaded sleeves  
Installation space L/W: approx. 200/100  
L/W/H: 740/130/250  
Additional weight approx. 50 kg

**Notice**

The configuration of the ballast (permitted roof load, wind load, snow load ...) for the particular application must be selected according to the specifications in the project planning instructions and be checked by a static engineer/construction engineer.

**Part No.**

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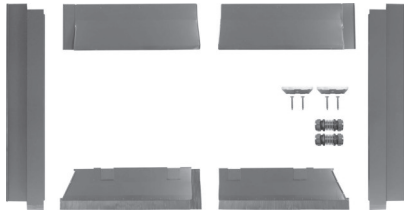
**Installation sets**

**Roof inlay mounting**

side-by-side, horizontal



Roof inlay mounting



**In-roof - side-by-side, horizontal**

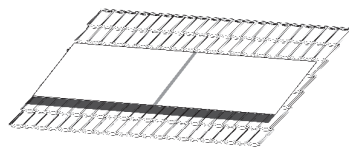
- for Hoval flat collectors UltraSol® 2 H, UltraSol® eco H
- for in-roof installation
- Sheet-metal flashing in a tiled roof (e.g. interlocking tiles, sliding tile, plain tiles)
- minimum roof pitch 25° (sheet metal)
- leaktight subroof necessary

Comprising:

- complete fitting accessories for attachment on cross battens (without collector connections)
- hydraulic collector connectors
- Complete sheet-metal flashing made from coated aluminium, RAL 7016

**Notice**

Collector connections, see following pages



for number  
of collectors  
per collector  
field units

Installation set

1	IDNH-1
2	IDNH-2
3	IDNH-3
4	IDNH-4
5	IDNH-5
6	IDNH-6

**Part No.**

6051 287
6051 288
6051 289
6051 290
6051 291
6051 292



Flexible stainless steel corrugated tube for solar heating circuits, material 1.4404, ready-insulated. Silicone cable for temperature sensor integrated. Weatherproof, UV-stable and PVC-free protective sleeve.

Solar cable Type	Nominal pipe width	Length m
SL 1515	DN 15	15
SL 1520	DN 15	20
SL 1525	DN 15	25
SL 2015	DN 20	15
SL 2020	DN 20	20
SL 2025	DN 20	25
SL 2515	DN 25	15
SL 2520	DN 25	20
SL 2525	DN 25	25

**Part No.**

2054 140  
2054 141  
2054 142  
2054 143  
2054 154  
2054 155  
2054 156  
2054 157  
2054 158

**Individual hydraulic sets**



**Hydraulics basic set GS 18**  
for hydraulic connection of a collector field with stainless steel corrugated pipe  
Consisting of:  
- 2 connection fittings 90°  
- 1 air vent plug  
- 1 dummy plug  
Collector connections:  
- Cu round pipe Ø 18 mm

Solar line size

DN 15  
DN 20  
DN 25

6051 315  
6051 316  
6051 317



Hydraulics basic set GS 18-3/4" FD90



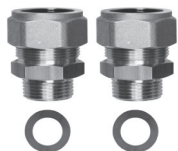
Hydraulics basic set GS 18-3/4" FD

**Hydraulics basic set GS 18-3/4"**  
for hydraulic connection of a collector field to screw connection 3/4" external thread flat-sealing  
Consisting of:  
- 2 connection fittings  
- 1 air vent plug  
- 1 dummy plug  
- 2 flat seals  
Collector connections:  
- Cu round pipe Ø 18 mm

Designation	Connection fitting
FD90	90°
FD	straight

6051 314  
6051 313

Solar cables



**Connection set armature group flow/return**  
for connecting the Hoval solar cables to a solar armature group 3/4" (e.g. SAG 20 or equalising valve DN 20). Solar cable side with metal sealing. Armature group side with flat seal (PTFE, Teflon resistant to temperatures up to 260 °C).

Size solar cable	Connection fitting
DN 15	R 3/4"
DN 20	R 3/4"
DN 25	R 3/4"

Part No.

6026 411  
6026 412  
6026 413



**Solar branch kit FL/RT**  
for connecting several collector fields to a shared Hoval solar line. Metallically sealing. 3 connections. Consisting of:  
- 2 T-pieces

DN 15  
DN 20  
DN 25

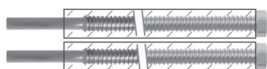
6042 233  
6042 234  
6042 235



**Connection coupling**  
for extending the solar cable

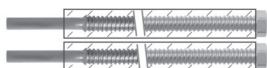
Type	
VKSL15	to solar cable DN 15
VKSL20	to solar cable DN 20
VKSL25	to solar cable DN 25

2054 159  
2054 160  
2054 161



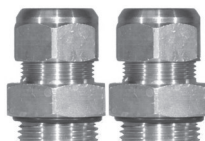
**Connection set type WES DN 20**  
for connecting a collector field (with connecting angles) to a pipeline created by the customer. 2 stainless steel corrugated pipes with 13 mm PE heat insulation, incl. screw connection, 3/4" or 22 x 1 x 100 mm copper solder bush, L: 1000 mm

2054 162



**Connection set type WES DN 20**  
for connecting a collector field (with connecting angles) to a pipeline created by the customer. 2 stainless steel corrugated pipes with 13 mm PE heat insulation, incl. screw connection, 3/4" or 22 x 1 x 100 mm copper solder bush, L = 3000 mm

2062 006



**Transition screw connection to connection set WES**  
Compression fitting 3/4" external thread fits 22 x 1 mm copper end piece for further installation with steel pipe. Price includes 2 pieces

2054 163



**Hydraulic connection**  
for collector field distance max. 30 cm  
Consisting of:  
2 corrugated tubes DN 20 insulated L = 500 mm on both sides 3/4" connection with seal 2 connection brackets 90° 3/4"



**Hydraulic extension set ESN**  
for hydraulic connection of the collectors side by side.  
Consisting of:  
- 2 elastic collector connections with squeezing ring screw connections (compensator), incl. insulation



**Hydraulic extension set ESU-ID**  
for serial hydraulic connection of collectors/collector rows lying one above the other (in-roof).  
Max. number of elbows:  
- 1 per collector field  
Max. number of collectors:  
- 4 per collector field  
Consisting of:  
- 1 elastic connection bracket 90° with squeezing ring screw connections  
Pipe axis distance: 300 mm  
- 2 dummy plugs



**Lock set VS-US2**  
for hydraulic closure of a collector field.  
- 1 vent plug  
- 1 dummy plug  
Collector connections:  
- ø 18 mm Cu round pipe



**Connection set AS-US2 18**  
for hydraulic connection of a collector field to the stainless steel corrugated pipe  
Consisting of:  
- 2 connection fittings 90°  
Collector connections:  
- Cu round pipe Ø 18 mm

Solar line size

- DN 15
- DN 20
- DN 25



Connection set AS-US2 18-3/4" FD90



Connection set AS-US2 18-3/4" FD

**Connection set AS-US2 18-3/4"**  
for hydraulic connection of a collector field to screw connection  
3/4" external thread flat-sealing  
Consisting of:  
- 2 connection fittings  
- 2 flat seals  
Collector connections:  
- Cu round pipe Ø 18 mm

Designation	Connection fitting
FD90	90°
FD	straight

**Part No.**

6051 202

6051 318

6051 319

6051 232

6051 322

6051 323

6051 324

6051 321

6051 320



**Balancing valve TN**

As a regulating and shut-off valve with direct display of the volume flow on the bypass.  
Max. operating temperature 185 °C

DN	Measuring range l/min	Connection Rp x Rp	kvs
20	2-12	3/4" x 3/4"	2.2
20	8-30	3/4" x 3/4"	5.0
25	10-40	1" x 1"	8.1
32	20-70	1 1/4" x 1 1/4"	17.0

**Part No.**

2038 034  
2038 035  
2038 036  
2038 037

**Accessories**



**Freeze protection mixture  
PowerCool DC 923-PXL**

on basis propylene glycol  
mixed with softened water  
with corrosion protection  
Frost protection: up to -23 °C  
Content plastic container: 30 kg

2054 403



**Freeze protection concentrate  
PowerCool DC 924-PXL**

on basis propylene glycol  
completely mixable with water  
with corrosion protection  
Frost protection: -20 °C with  
40 % mixture ratio  
Content plastic container: 10 kg

2009 987

















**Hand refractometer**

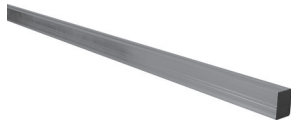
for measuring the cloud point of  
water-propylene glycol mixtures,  
water-ethylene glycol mixtures,  
and water-ethanol mixtures  
Coolant HighSOL refractive index nD20

2066 933

Individual sets / further installation sets

		Part No.
	<b>Roof bar US2-DBAV - adj. tile</b> for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS	6037 730
	<b>Roof bar US2-DBCv - tile HD</b> for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS Version stainless steel high load	6037 763
	<b>Screw set roof bars US2-SHS</b> 6x wood screws Torx 8x80 st. steel	6037 732
	<b>Packing plate 2mm</b> for levelling the roof bars	2061 367
	<b>Packing plate 3mm</b> for levelling the roof bars	2061 368
	<b>Hanger bolt US2-ss - individual</b> M12x300 incl. quick-mount adapter incl. EPDM seal	2061 347
	<b>Double level screw US2-Dss</b> 2x M12x300 incl. mounting plate incl. EPDM seals	2061 348
	<b>Roof bar US2-DBC - type plain</b> for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS	2061 344
	<b>Roof bar US2-DBC - slate</b> for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS	2061 398
	<b>Installation set T-head bolt</b> 2x bolt and nut	6037 766
	<b>Clamp US2-BFK - tin joint</b>	6037 795
	<b>Quick-mount adapter M10 cpl.</b> for attaching the carrier profiles	6037 773
	<b>Quick-mount adapter M12 cpl.</b> for attaching the carrier profiles	6037 774
	<b>Hanger bolt M12x300 CR</b> incl. EPDM seal, nut and locknut	2053 051

**Part No.**



**Carrier profile ADKBV cpl. 1360 mm**  
On-roof short base - vertical

6050 655



**Carrier profile ADLBV cpl. 1986 mm**  
On-roof base long - vertical

6050 656



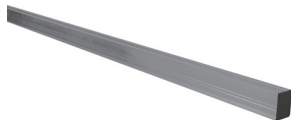
**Carrier profile ADKEV cpl. 1252 mm**  
On-roof expansion short - vertical  
incl. profile connector 45 cpl.

6050 657



**Carrier profile ADLEV cpl. 1878 mm**  
On-roof expansion long - vertical  
incl. profile connector 45 cpl.

6050 658



**Carrier profile ADBH cpl. 2260 mm**  
On-roof base - horizontal

6050 659



**Carrier profile ADEH cpl. 2152 mm**  
On-roof expansion - horizontal  
incl. profile connector 45 cpl.

6050 660



**Profile connector 45 cpl.**  
incl. self-tapping screws

6037 787



**Elevation 20, 30, 45° V cpl.**  
Vertical version  
incl. 4 cross connectors cpl.

6050 661



**Elevation 20, 30, 45° H cpl.**  
horizontal version  
incl. 4 cross-connectors cpl.

6037 790



**Elevation 60° H cpl.**  
horizontal version  
incl. 4 cross-connectors cpl.

6042 143



**Wind bracing H/V cpl.**  
for horizontal or vertical elevation

6037 762

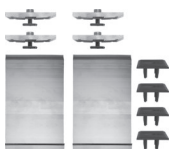




**Cross-connector cpl.**  
for attaching the elevation  
with the carrier profiles

**Part No.**

6037 788



**Mounting set 5-US2 ADGS**  
**Collector fastening basic set**  
On-roof mounting  
Consisting of:  
- 4 US2 collector end clamps cpl.  
- 4 end caps 45 Hoval  
- 2 anti-slip protections

6050 662



**Mounting set 5-US2 ADES**  
**Collector fastening extension set**  
On-roof mounting consisting of:  
- 2 US2 collector middle clamps cpl.  
- 2 anti-slip protections

6050 663



**Mounting set 5-US2 BSGS**  
**Collector fastening basic set**  
Flat roof mounting concrete base  
Consisting of:  
- 4 US2 collector end clamps cpl.

6050 664



**Mounting set 5-US2 BSES**  
**Collector fastening extension set**  
Flat roof mounting concrete base  
Consisting of:  
- 2 US2 collector middle clamps cpl.

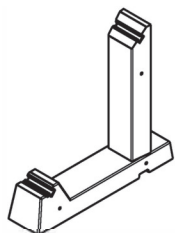
6050 665



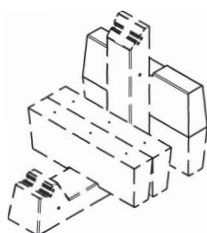
**Fastening set 5-US2 IDKS**  
**Collector fastening in-roof**  
Consisting of:  
- 2 US2 collector clamps  
- 4 chipboard screws 5x35 TX25  
UltraSol® 2 V in-roof mounting:  
- 6 US2 collector clamps per  
collector side (end and middle clamp)  
UltraSol® 2 H in-roof mounting:  
- 4 US2 collector clamps per  
collector side (end and middle clamp)

6050 666

Individual sets concrete base



**Concrete base 45° cpl.**  
 for Hoval UltraSol® 2 H  
 flat plate collector  
 2-piece, slope 45° with cast-in  
 retaining tube profile for  
 collector fastening  
 incl. folding split pin  
 6/40/33 galvanised  
 for protection against lifting off  
 incl. support turn protector  
 L/W/H: 930/190/865 mm  
 Weight: approx. 92 kg



**Additional weight for concrete base**  
 for UltraSol® 2 H flat plate collector  
 for increasing loading weight  
 in areas with increased wind loads  
 or on high buildings.  
 incl. 3 M8 threaded sleeves  
 Installation space L/W: approx. 200/100  
 L/W/H: 740/130/250  
 Additional weight approx. 50 kg



**Protective mat with aluminium lining**  
 for concrete base  
 for protecting the roof cladding  
 and compensating irregularities  
 L/W/H: 1000/260/6 mm

**Notice**

The configuration of the ballast (permitted roof load, wind load, snow load ...) for the particular application must be selected according to the specifications in the engineering instructions and be checked by a static engineer/construction engineer.

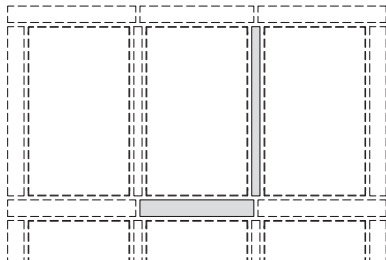
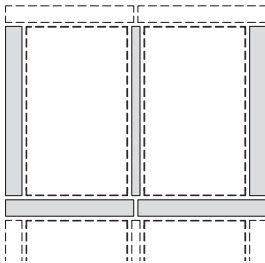
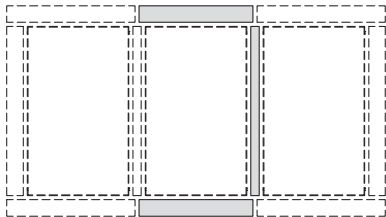
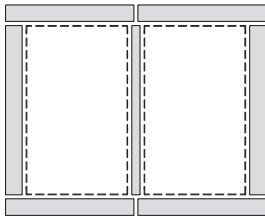
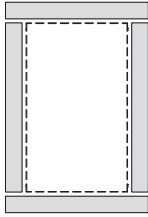
**Part No.**

6050 805

2075 124

2061 579

**Individual sets “in-roof”**  
without hydraulic connections



**Notice**

You will find examples of how to assemble the variants following the individual sets.

**Basic set in-roof 2-BLGS 1V**

Set for in-roof mounting of 1 UltraSol® 2 V flat plate collector  
Consisting of:  
- Mounting material for fastening of the collector on the cross battens  
- Collector stop single collector  
- Ridge sheet single collector incl. supports  
- Eaves plate single collector  
- Side plates left and right

**Basic set in-roof 2-BLGS 2VN**

Set for in-roof mounting of 2 UltraSol® 2 V flat plate collectors side by side  
Consisting of:  
- Mounting material for fastening of the collectors on the cross battens  
- Collector stops for 2 collectors  
- Ridge plates for 2 collectors incl. supports  
- Eaves plates for 2 collectors  
- Side plates left and right  
- Intermediate plate

**Extension set in-roof 2-BLES 1VN**

Set for in-roof mounting of an additional UltraSol® 2 V flat plate collector side by side  
Consisting of:  
- Mounting material for fastening of the collector on the cross battens  
- Collector stop middle  
- Ridge sheet middle incl. supports  
- Eaves sheet middle  
- Intermediate plate

**Extension set in-roof 2-BLES 2VU**

Set for in-roof mounting of two additional UltraSol® 2 V flat plate collectors one above the other  
Consisting of:  
- Mounting material for fastening of the collectors on the cross battens  
- Spacers  
- Centre plates including connectors  
- Side plates left and right  
- Intermediate plate

**Extension set in-roof 2-BLES 1VUN**

Set for in-roof mounting of an additional UltraSol® 2 V flat plate collector one above the other and side by side  
Consisting of:  
- Mounting material for fastening of the collectors on the cross battens  
- Spacers  
- Centre plates including connectors  
- Intermediate plate

**Part No.**

6051 293

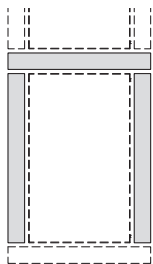
6051 294

6051 295

6051 296

6051 297

**Part No.**



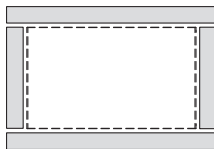
**Extension set in-roof 2-BLES 1VU**

Set for in-roof mounting of an additional UltraSol® 2 V flat plate collector one above the other

Consisting of:

- Mounting material for fastening of the collector on the cross battens
- Spacers
- Centre plates including connectors
- Side plates left and right

6051 298



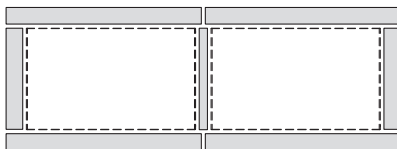
**Basic set in-roof 2-BLGS 1H**

Set for in-roof mounting of 1 UltraSol® 2 H flat plate collector

Consisting of:

- Mounting material for fastening of the collector on the cross battens
- Collector stop single collector
- Ridge sheet single collector incl. supports
- Eaves plate single collector
- Side plates left and right

6051 299



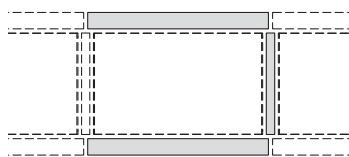
**Basic set in-roof 2-BLGS 2HN**

Set for in-roof mounting of 2 UltraSol® 2 H flat plate collectors side by side

Consisting of:

- Mounting material for fastening of the collectors on the cross battens
- Collector stops for 2 collectors
- Ridge plates for 2 collectors incl. supports
- Eaves plates for 2 collectors
- Side plates left and right
- Intermediate plate

6051 300



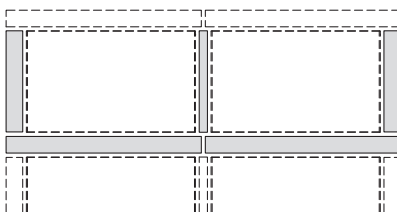
**Extension set in-roof 2-BLES 1HN**

Set for in-roof mounting of an additional flat plate collector UltraSol® 2 H side by side

Consisting of:

- Mounting material for fastening of the collector on the cross battens
- Collector stop middle
- Ridge sheet middle incl. supports
- Eaves sheet middle
- Intermediate plate

6051 301



**Extension set in-roof 2-BLES 2HU**

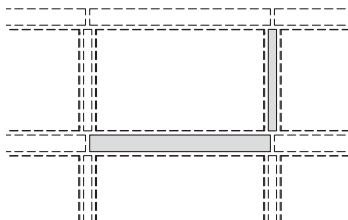
Set for in-roof mounting of two additional flat plate collectors UltraSol® 2 H one above the other

Consisting of:

- Mounting material for fastening of the collectors on the cross battens
- Spacers
- Centre plates including connectors
- Side plates left and right
- Intermediate plate

6051 302

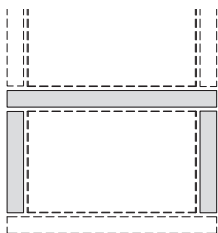
**Part No.**



**Extension set in-roof 2-BLES 1HUN**

Set for in-roof mounting of an additional flat plate collector UltraSol® 2 H one above the other and side by side  
 Consisting of:  
 - Mounting material for fastening of the collectors on the cross battens  
 - Spacers  
 - Centre plates including connectors  
 - Intermediate plate

6051 303



**Extension set in-roof 2-BLES 1HU**

Set for in-roof mounting of an additional flat plate collector UltraSol® 2 H one above the other  
 Consisting of:  
 - Mounting material for fastening of the collector on the cross battens  
 - Spacers  
 - Centre plates including connectors  
 - Side plates left and right

6051 304



**Intermediate plate, vertical**

vertical covering strip for covering between 2 collectors

2075 478



**Intermediate plate, horizontal**

horizontal covering strip for covering between 2 collectors

2075 479



**Eaves sheet panel V**

vertical eaves sheet panel for covering the collector end face

6051 721

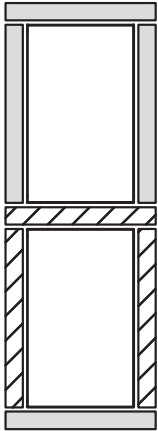


**Eaves sheet panel H**

horizontal eaves sheet panel for covering the collector end face

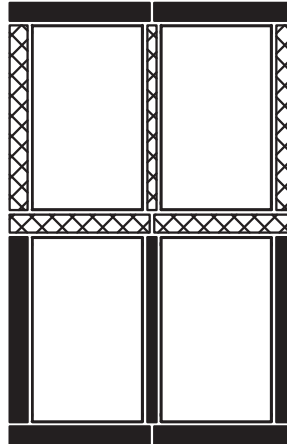
6051 722

Examples for individually arranged in-roof sets for different collector surfaces



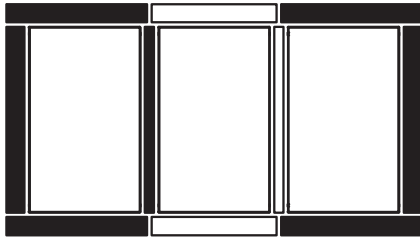
to be ordered:

- 1 x 6051 293 **basic set in-roof BLGS 1V**
- ▨ 1 x 6051 298 **expansion set in-roof BLES 1VU**



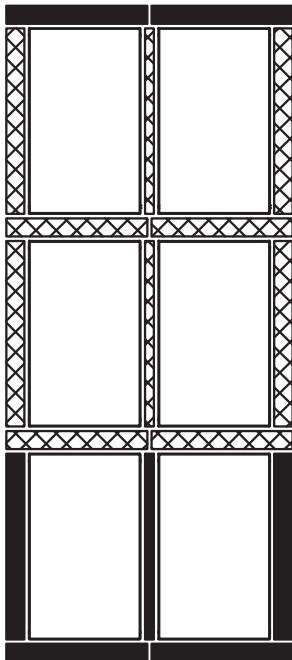
to be ordered:

- 1 x 6051 294 **basic set in-roof BLGS 2VN**
- ▨ 1 x 6051 296 **expansion set in-roof BLES 2VU**



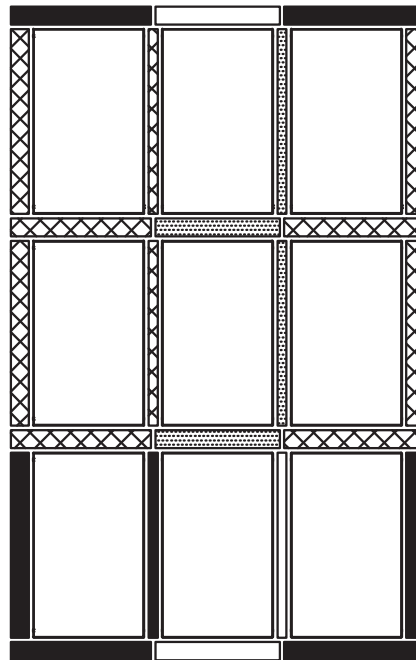
to be ordered:

- 1 x 6051 294 **basic set in-roof BLGS 2VN**
- 1 x 6051 295 **expansion set in-roof BLES 1 VN**



to be ordered:

- 1 x 6051 294 **basic set in-roof BLGS 2VN**
- ▨ 2 x 6051 296 **expansion set in-roof BLES 2VU**



to be ordered:

- 1 x 6051 294 **basic set in-roof BLGS 2VN**
- 1 x 6051 295 **expansion set in-roof BLES 1VN**
- ▨ 2 x 6051 296 **expansion set in-roof BLES 2VU**
- ▩ 2 x 6051 297 **expansion set in-roof BLES 1VUN**

## UltraSol® 2

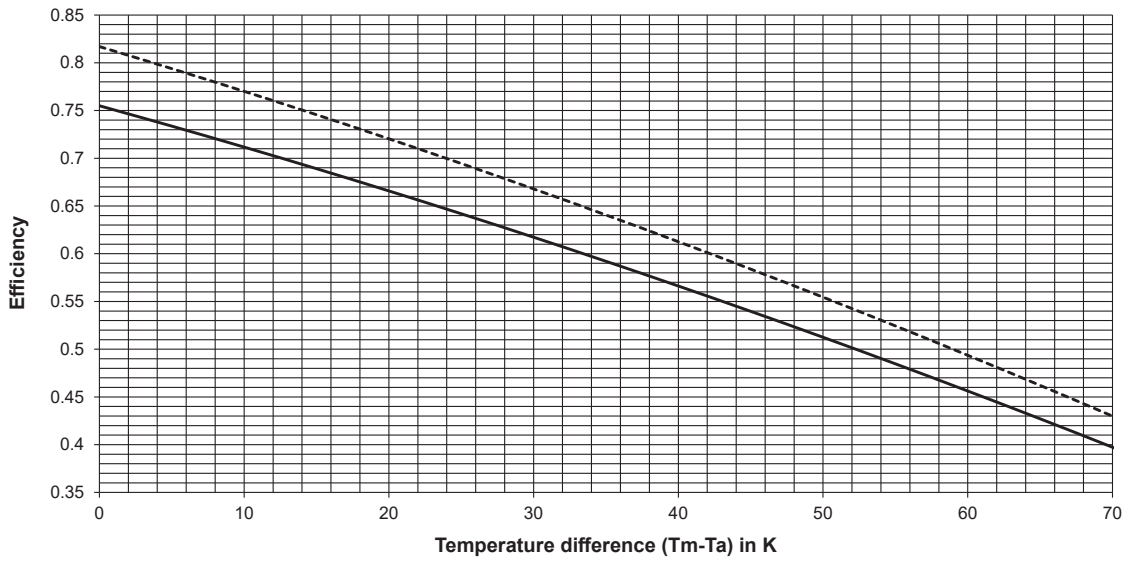
Type	UltraSol® 2		
		V	H
Optical efficiency (aperture surface) $\eta_{0,b}^{2)}$	%	81.7	81.7
$a_1^{2)}$	W/(m <sup>2</sup> K)	4.55	4.55
$a_2^{2)}$	W/(m <sup>2</sup> K <sup>2</sup> )	0.014	0.014
Optical efficiency (gross area) $\eta_{0,b}^{1)}$	%	75.5	75.5
$a_1^{1)}$	W/(m <sup>2</sup> K)	4.2	4.2
$a_2^{1)}$	W/(m <sup>2</sup> K <sup>2</sup> )	0.013	0.013
<b>Reference surfaces</b>			
• Total surface area	m <sup>2</sup>	2.53	2.53
• Aperture surface	m <sup>2</sup>	2.33	2.33
• Absorber surface	m <sup>2</sup>	2.33	2.33
<b>Collector/casing</b>			
• Design		Extruded sections	
• Length, width, height		see dimensional drawing	
• Material		Aluminium	
• Weight	kg	43	43
<b>Absorber</b>			
• Absorber area coating		selective	
• Solar absorption level	%	95	95
• Hemispheric emissions level	%	5	5
• Heat transfer medium content	l	1.5	1.7
• Flow shape		Serpentine manifold	
• Number of connections		4	
• Configuration of connections		Compression fittings - CU round pipe Ø 18 mm	
<b>Glass cover (transparent cover)</b>			
• Product name		Structured toughened safety glass (ESG) with anti-reflective coating on one side	
• Transmission level	%	94	94
• Thickness	mm	3.2	
<b>Thermal insulation</b>			
• Material		Mineral wool	
• Heat conductivity	W/(m <sup>2</sup> K)	0.039	0.039
• Thickness	mm	20	20
• Hail resistance class		HW 3 (hailstones of ø up to 30 mm)	
<b>Application limits</b>			
• Standard standstill temperature	° C	180	180
• Max. perm. operating pressure	bar	10	10
• Permitted heat transfer medium		Glycol/water mixture	
• Specific flow rate approx.	l/(h m <sup>2</sup> )	15-50	15-50
• Nominal flow per collector approx.	l/h	40-100	40-100
• Min. collector pitch		22°	
• Max. collector pitch		90° <sup>3)</sup>	

1) Peak efficiency of the collector ( $\eta_b$  at  $T_m^* = 0$ ), with reference to  $T_m^*$ , based on the direct irradiation intensity  $G_b$  (reference area: gross area of 2.53 m<sup>2</sup>)

2) Peak efficiency of the collector ( $\eta_b$  at  $T_m^* = 0$ ), with reference to  $T_m^*$ , based on the direct irradiation intensity  $G_b$  (reference area: aperture surface with 2.33 m<sup>2</sup>)

3) Due to the specifications of the German Institute for Building Technology (DIBT), the collectors can be used in Germany up to a maximum inclination of 75°! This regulation is also partly applied in Austria.

Efficiency characteristic curve UltraSol® 2



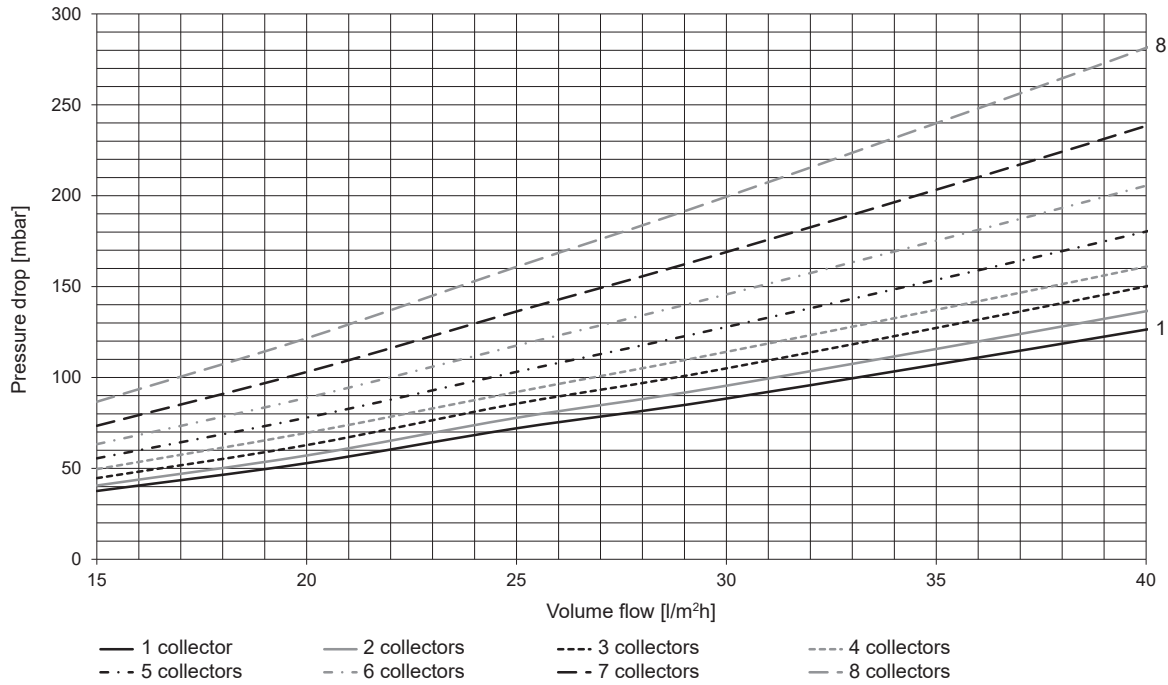
— UltraSol® 2 (Gross area)  
 - - - - UltraSol® 2 (Aperture surface)

Tm = average collector temperature)  
 Ta = Ambient temperature



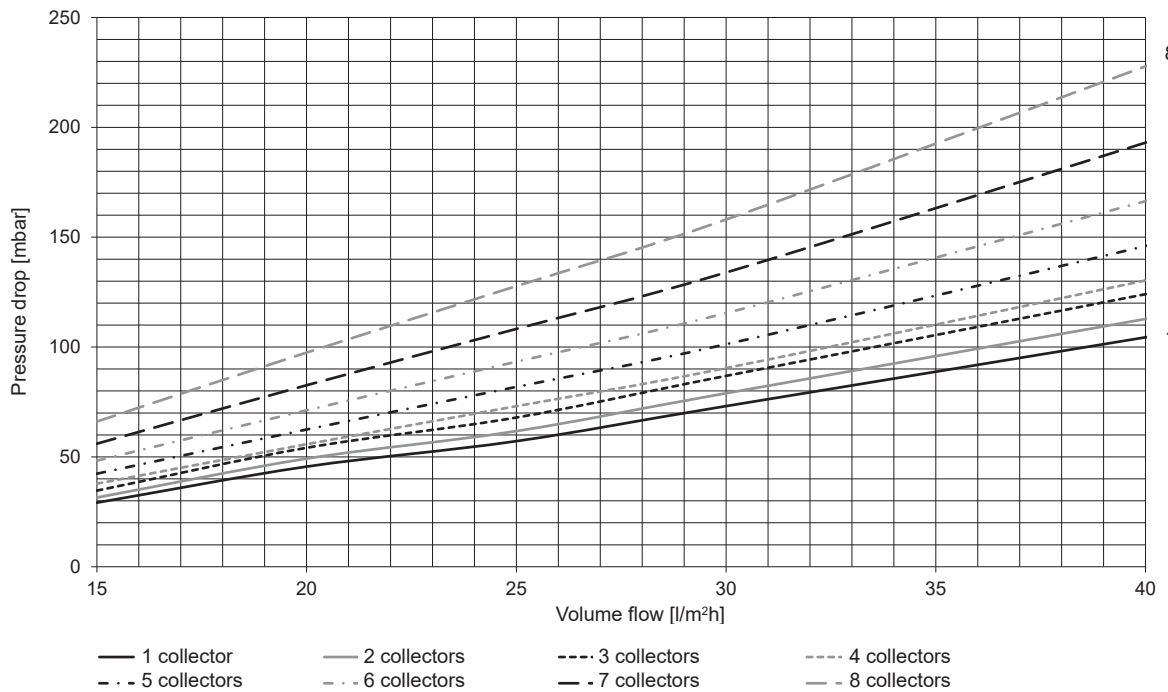
**Pressure drop - UltraSol® 2, vertical**

Water-Glycol mixture - temp. 20 °C



**Pressure drop - UltraSol® 2, horizontal**

Water-Glycol mixture - temp. 20 °C

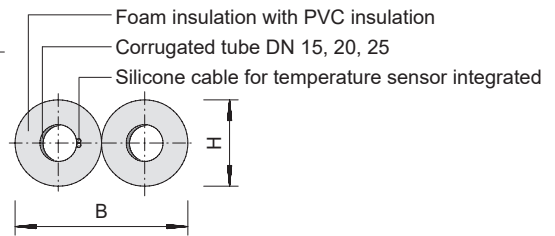


**Solar cable SL**

- Flexible stainless steel corrugated tube, material 1.4404.
- Max. pressure at 200 °C: 10 bar
- Operating temperature for stainless steel 100-600 °C

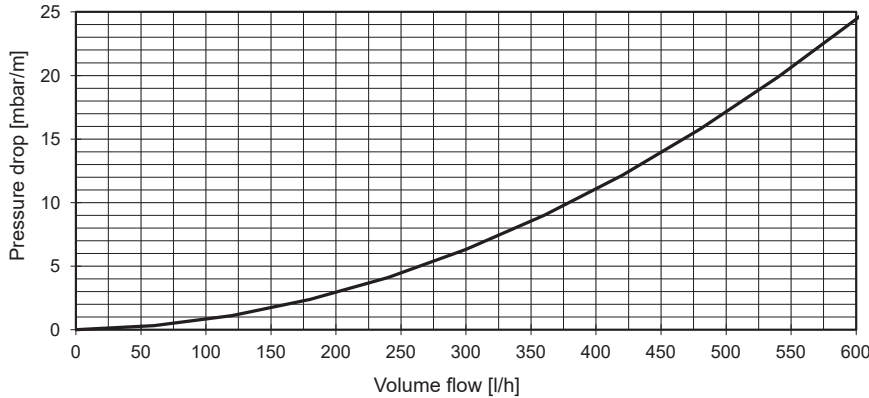
Type	Nominal pipe width DN	Internal diameter mm	External diameter mm	Bending radius min. mm	Burst pressure bar	Weight g/m	Wall thickness mm	Content l/m
SL 15	15 R ½"	16.6	21.4	25	44	140	0.18	0.28
SL 20	20 R ¾"	20.6	26.2	30	36	195	0.18	0.42
SL 25	25 R 1"	25.6	31.6	35	28	235	0.20	0.65

Type	DN	B mm	H mm	Insulation thickness mm
SL 15	15 R ½"	105	53	17
SL 20	20 R ¾"	135	68	19
SL 25	25 R 1"	155	80	14

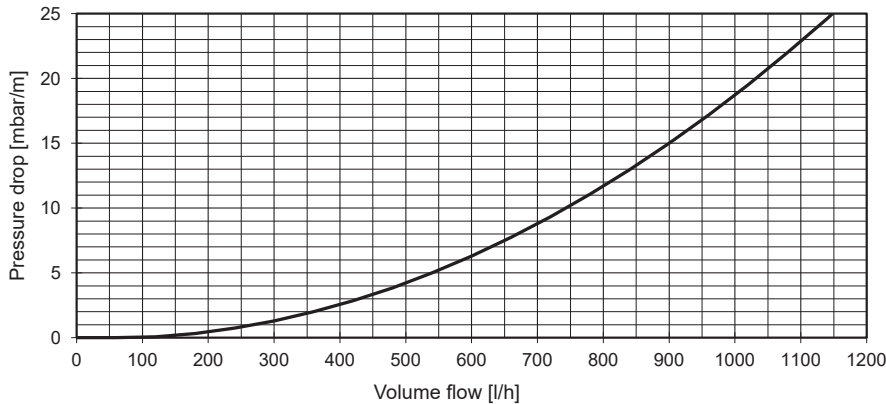


**Specific pressure drop value** (per metre individual pipe)  
 Glycol/water mixture 40/60 % and 40 °C

**DN 15**

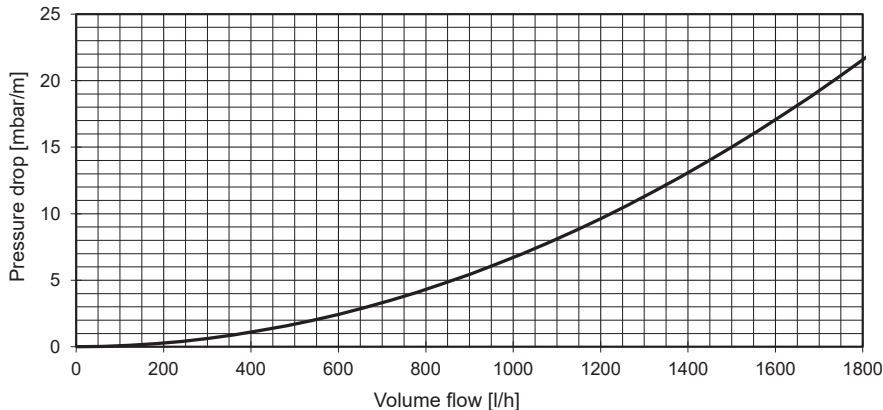


**DN 20**

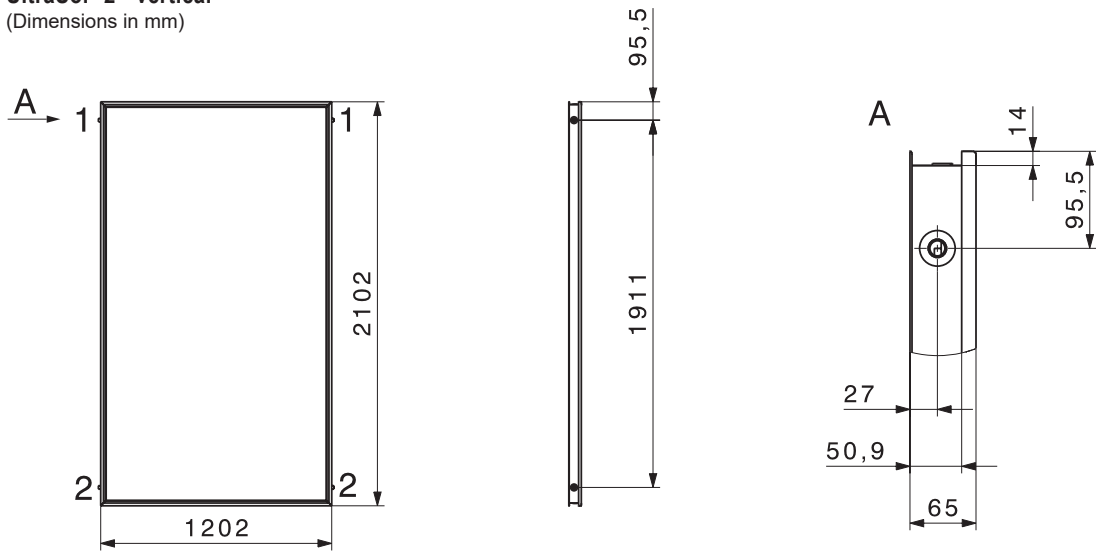


1 mbar = 100 Pa = 0.1 kPa

**DN 25**



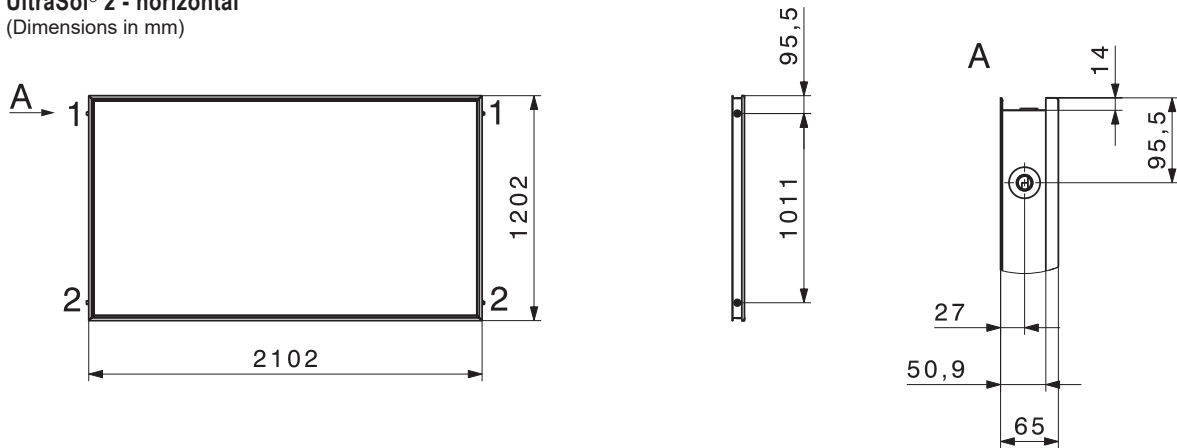
**UltraSol® 2 - vertical**  
(Dimensions in mm)



- 1 Collector connection, outlet 3/4" (with Hoval hydraulic connection brackets)
  - 2 Collector connection, inlet 3/4" (with Hoval hydraulic connection brackets)
- Sensor: position, see Engineering

- One-sided connection left or right possible (not Tichelmann)
- Connection on alternating sides possible (Tichelmann)

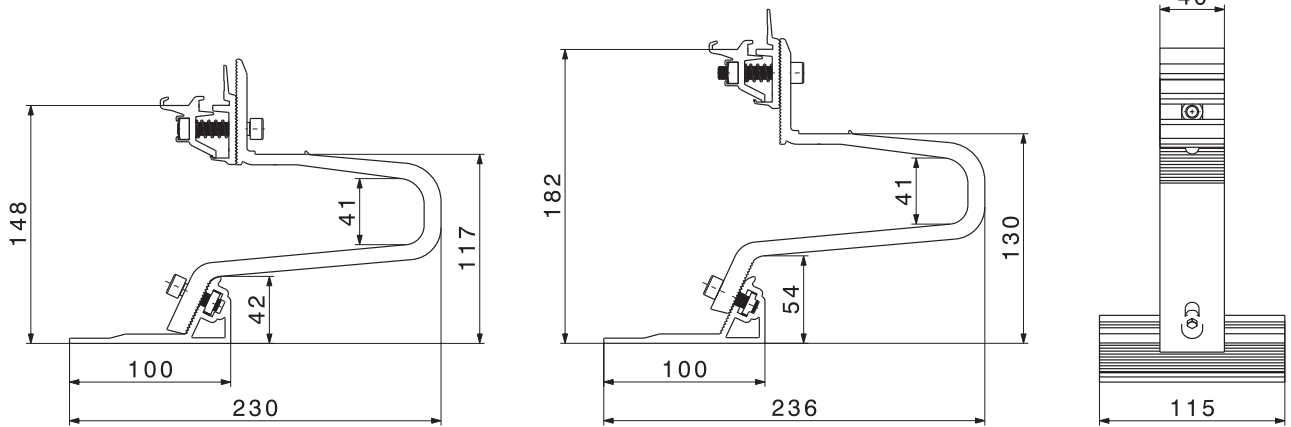
**UltraSol® 2 - horizontal**  
(Dimensions in mm)



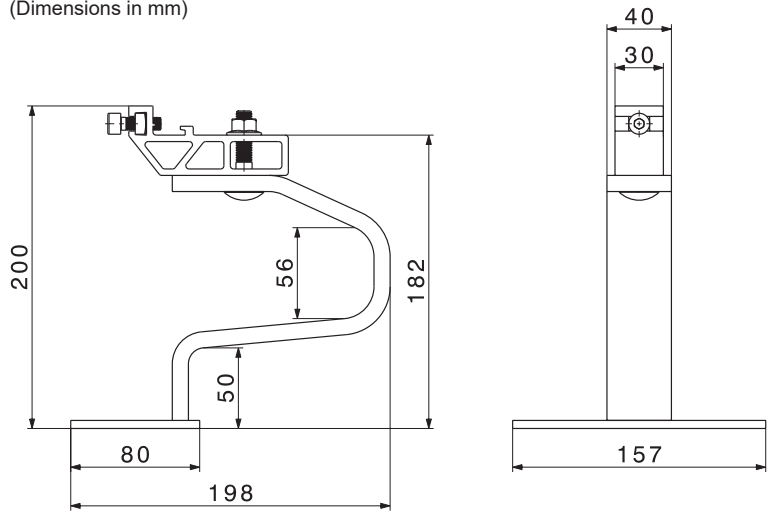
- 1 Collector connection, outlet 3/4" (with Hoval hydraulic connection brackets)
  - 2 Collector connection, inlet 3/4" (with Hoval hydraulic connection brackets)
- Sensor: position, see Engineering

- One-sided connection left or right possible (not Tichelmann)
- Connection on alternating sides possible (Tichelmann)

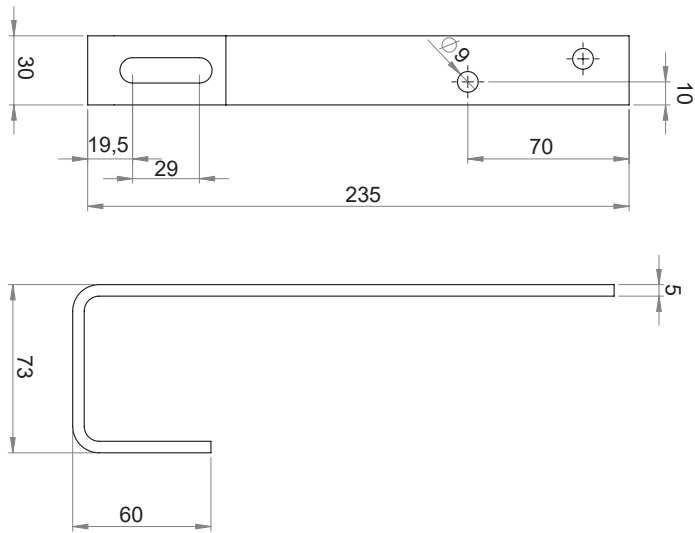
**Roof bar tile adjustable - for on-roof installation**  
(Dimensions in mm)



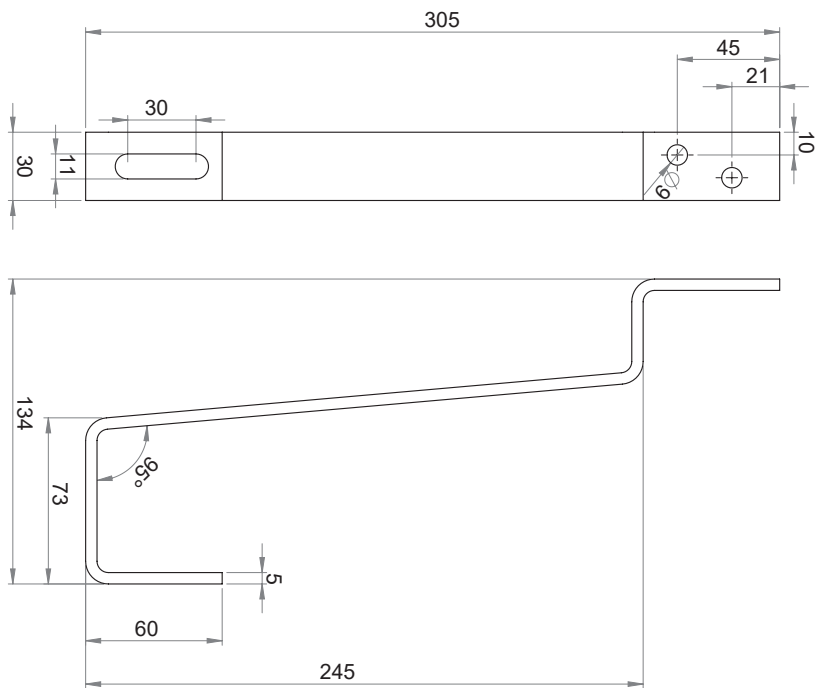
**Roof bar tile heavy duty - for on-roof installation**  
(Dimensions in mm)



**Roof bar slate - for on-roof installation**  
(Dimensions in mm)



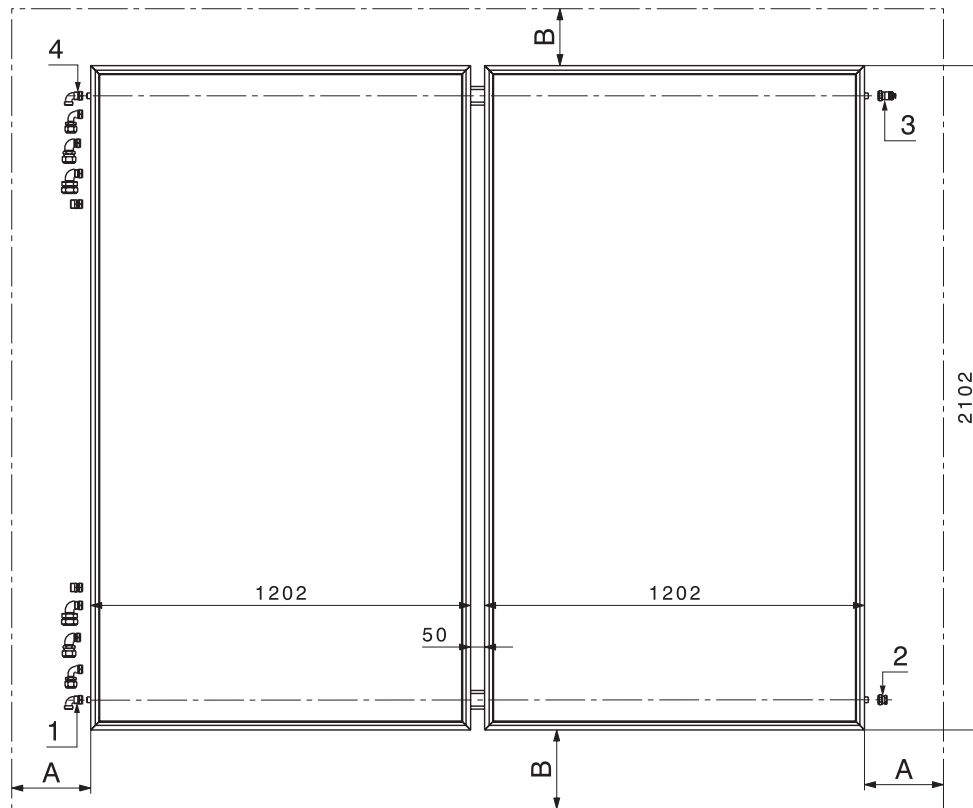
**Roof bar plain tile - for on-roof installation**  
(Dimensions in mm)



Space requirements

UltraSol® 2 - vertical

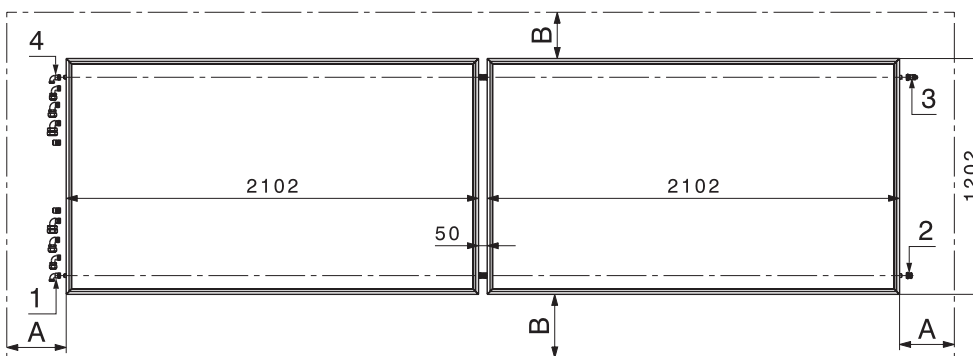
(Dimensions in mm)



Inverted configuration of the connections is also possible.

UltraSol® 2 - horizontal

(Dimensions in mm)



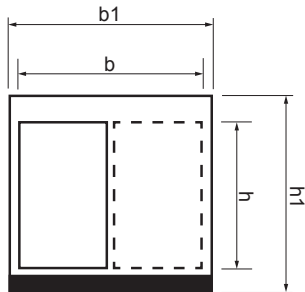
- 1 Inlet/collector return; connection Ø 18 mm CU round pipe
  - 2 Dummy plug
  - 3 Dummy plug with integrated manual vent
  - 4 Outlet/collector flow hot; connection Ø 18 mm CU round pipes
- Select short line routing  
Sensor: position, see Engineering

- A Space for installation/removal of connection brackets and collectors 250 mm.
- B top At least one tile length distance from the gable!
- B bottom At least one tile length distance from the end of the roof (eaves).  
Also comply with local regulations relating to snow safety (number of snow holders).

Space requirements

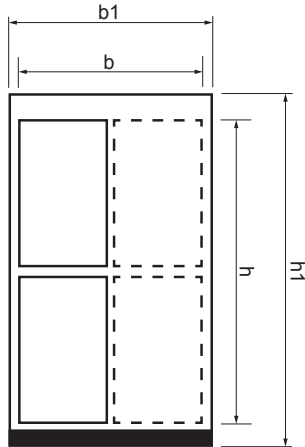
Collector field - Roof inlay mounting, horizontal  
(Dimensions in cm)

1-row



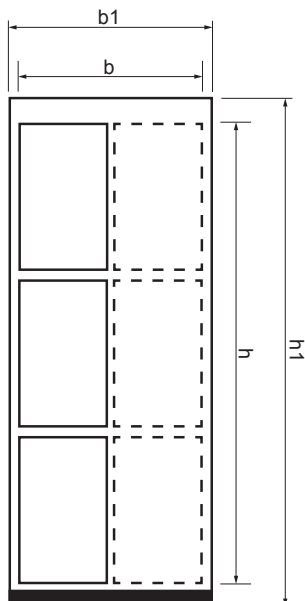
Number of collectors		Height h	Height h1	Width b	Width b1
		cm	Outer dim. sheet metal cm	collectors cm	Outer dim. sheet metal cm
1				120	153
2				245	278
3				371	404
4				496	529
5		210	272	621	654
6				746	779
7				871	604
8				997	1030

2-row



Number of collectors		Height h	Height h1	Width b	Width b1
Total	per row	cm	Outer dim. sheet metal cm	collectors cm	Outer dim. sheet metal cm
2	1			120	153
4	2			245	278
6	3			371	404
8	4			496	529
10	5	430	492	621	654
12	6			746	779
14	7			871	904
16	8			997	1030

3-row



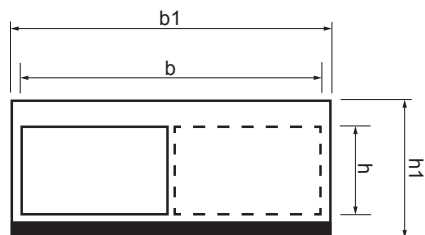
Number of collectors		Height h	Height h1	Width b	Width b1
Total	per row	cm	Outer dim. sheet metal cm	collectors cm	Outer dim. sheet metal cm
3	1			120	153
6	2			245	278
9	3			371	404
12	4			496	529
15	5	651	712	621	654
18	6			746	779
21	7			871	904
24	8			997	1030

Space requirements

Collector field - Roof inlay mounting, horizontal

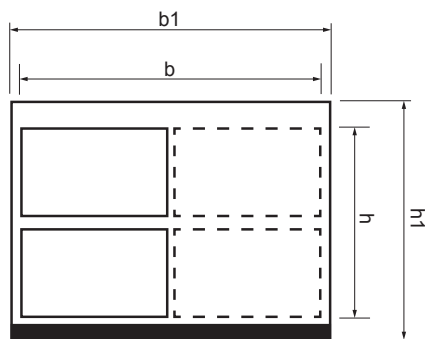
(Dimensions in cm)

1-row



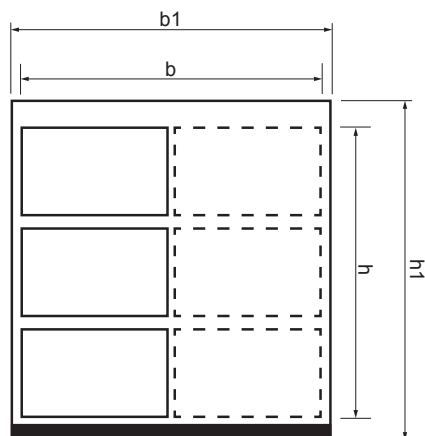
Number of collectors	Height h	Height h1	Width b	Width b1
	cm	Outer dim. sheet metal cm	cm	Outer dim. sheet metal cm
1			210	243
2			425	458
3			641	674
4			856	889
5	120	182	1071	1104
6			1286	1319
7			1501	1534
8			1717	1750

2-row



Number of collectors		Height h	Height h1	Width b	Width b1
Total	per row				
2	1			210	243
4	2			425	458
6	3			641	674
8	4			856	889
10	5	250	312	1071	1104
12	6			1286	1319
14	7			1501	1534
16	8			1717	1750

3-row

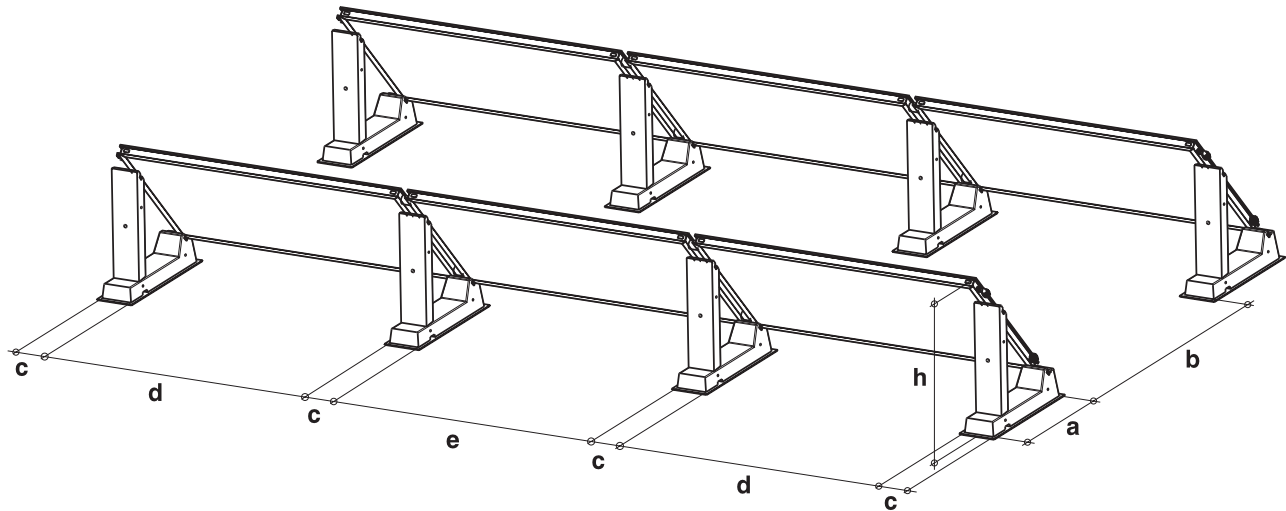


Number of collectors		Height h	Height h1	Width b	Width b1
Total	per row				
3	1			210	243
6	2			425	458
9	3			641	674
12	4			856	889
15	5	381	442	1071	1104
18	6			1286	1319
21	7			1501	1534
24	8			1717	1750



**Space requirements**

**Concrete base - installation**  
(Dimensions in mm)



Type	Installation angle	h	a	b	c	d	e
UltraSol® 2	45°	*1083	930	min. 1100	215	1897	1937

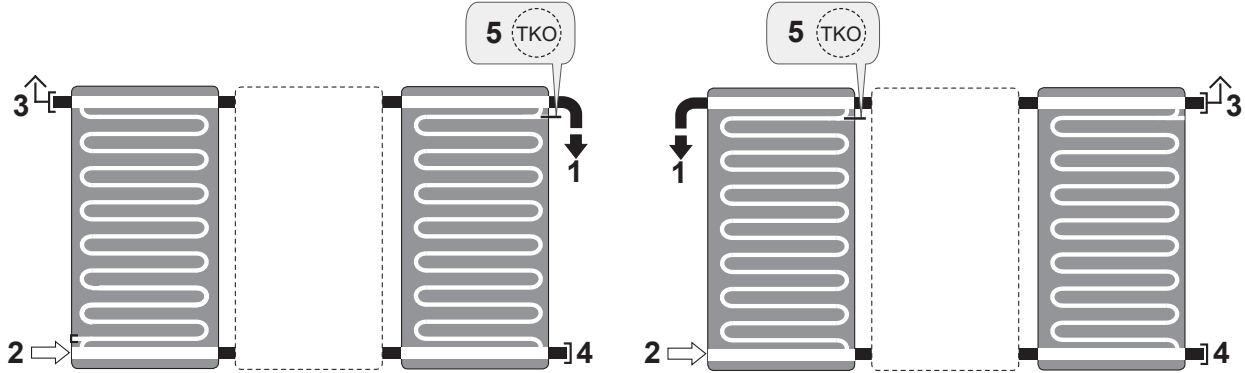
\* With protective mat

**Piping of the collector series**  
**Connection example for collector series**

**UltraSol® 2 V (collector vertical)**

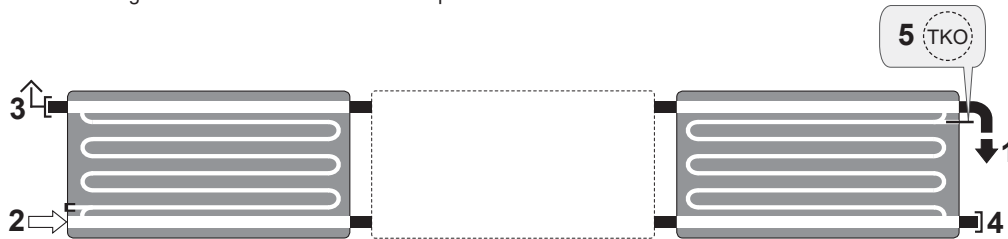
Connection variant: Tichelmann, max. 8 collectors/row  
 Inverted configuration of the connections is also possible.

Connection variant: non-Tichelmann, max. 8 collectors/row  
 Inverted configuration of the connections is also possible..



**UltraSol® 2 H (collector horizontal)**

Connection variant: Tichelmann, max. 8 collectors/row  
 Inverted configuration of the connections is also possible.



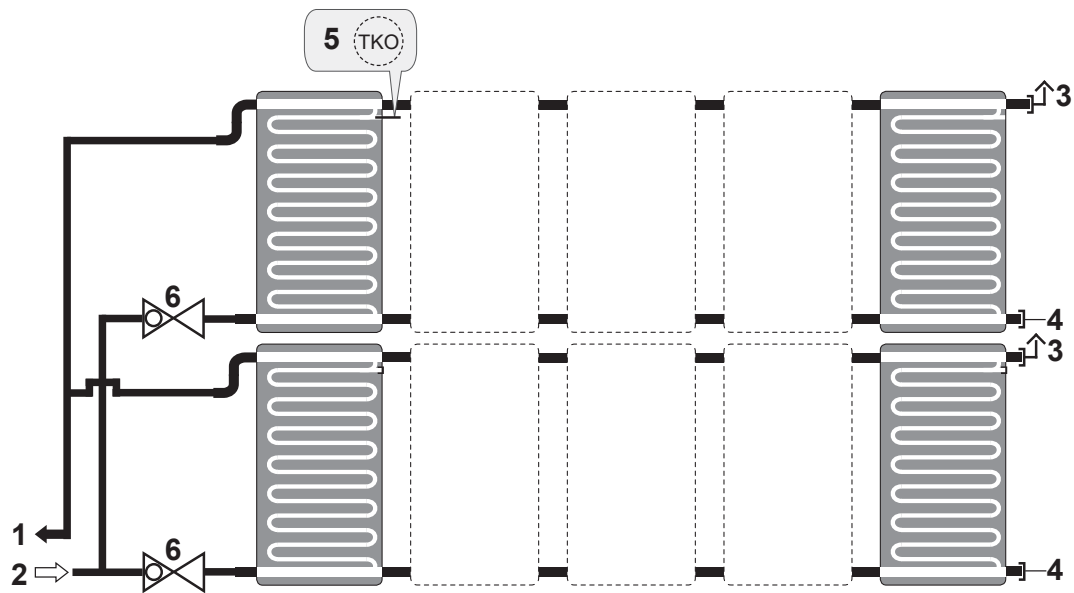
Connection variant: non-Tichelmann, max. 8 collectors/row  
 Inverted configuration of the connections is also possible.



- 1 Line from collector field (collector flow, warm) select short line routing
- 2 Line to collector field (collector return)
- 3 Dummy plug with integrated manual vent
- 4 Dummy plug
- 5 Immersion sleeve Differential control sensor or solar sensor

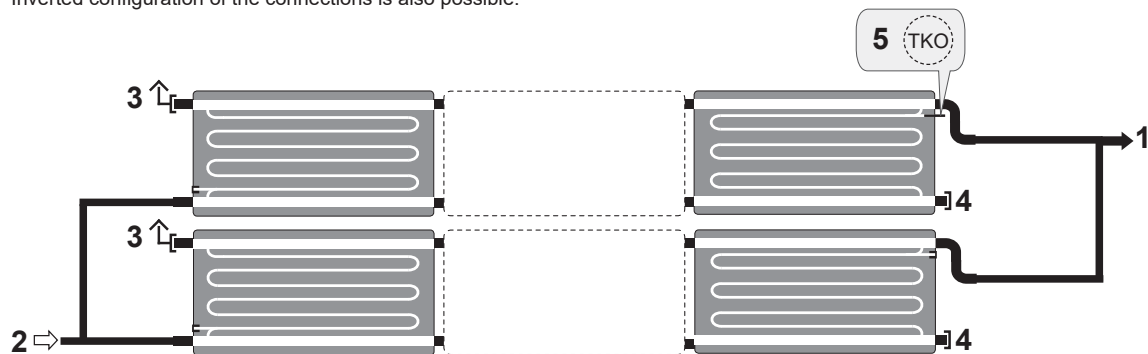
**UltraSol® 2 V (collector vertical)**

Connection variant: non-Tichelmann, max. 8 collectors/row  
 Inverted configuration of the connections is also possible.



**UltraSol® 2 H (collector horizontal)**

Connection variant: non-Tichelmann, max. 8 collectors/row  
 Inverted configuration of the connections is also possible.



- 1 ← Line from collector field (collector flow, warm)  
select short line routing
- 2 ⇐ Line to collector field (collector return)
- 3 ↗ Dummy plug with integrated manual vent
- 4 ▬ Dummy plug
- 5 (TKO) Immersion sleeve  
Differential control sensor or solar sensor
- 6 ⊠ Control valve

### Static dimensioning aid

The following requirements and directives must be complied with:

- Regionally applicable standards and regulations
- The installer is responsible for ensuring compliance with the relevant standards and local regulations.

#### *Germany/Austria:*

- The snow and wind loads are regulated by DIN EN 1991 and the associated national appendix.
- The load bearing capacities of building coverings are prescribed ÖNORM B 1991.
- ÖNORM M 7778 (Installation planning and installation of thermal solar collectors)
- Both the Austrian as well as the German regulation is based on European standard EN 1991-1-3. They are valid up to altitudes of 1500 m. Any altitudes above that are regulated by special national appendices.

#### *Switzerland:*

- SIA 261 applies.

### General information on statics

- Installation is only permissible on roof areas or substructures of sufficient load-bearing capacity. It is essential for the static load-bearing capacity of the roof or the substructure to be checked by the local statics engineer before the collectors are installed.
- The examination of the entire collector structure according to DIN 1055 Parts 4 and 5 is required by the local statics engineer, in particular in areas subject to high snowfall or high wind speeds. Attention in this must be paid to all special features of the installation site (foehn winds, venturi effects, eddy formation etc.) that can lead to increased load.

### Roof-mounted systems

- With roof-mounted systems, particular attention must be paid to the quality of the wood in the substructure with regard to the durability of the screw connections for attaching collector installation fixtures. The selection and also the number of roof connections must be adapted to the local snow and wind loads. Binding statements about the wind and snow loads as well as building altitudes about seal level must be obtained from the relevant authorities in the regions.
- If the roof anchors are exposed to maximum load, their geometry means that deformation will be unavoidable and contact between the roof anchor and the tiles can often not be prevented. As a result, it is recommended for metal tiles to be used if there will be high snow and wind loads.
- The significant number of roof connection sets is based on the calculated minimum number of attachment points for the planned number of collectors without taking account of the building-specific anchoring conditions of the roof covering and the building structure. The local force application via roof connection sets has been provided. The transmission of forces via the screw connection to the building structure does not form part of this calculation and must be verified separately.
- To prevent impermissible wind suction loads, the collectors must not be installed near the edges of the roof. The relevant standards must be observed in this case. When elevators are used, the upper edge of the collector must not project beyond the ridge of the roof. Collectors must not be installed under a height change, in order to avoid increased loads due to windblown or slipping snow from the higher section of the roof onto the collector array. If snow guards are mounted on the more elevated roof for this reason, the statics of this roof must be inspected.

### Personal protection

- In order to carry out work on the roof, safety equipment for personal protection must be included in the planning. For pitched roofs, these are safety roof hooks and for flat roofs, suitable attachment points or cable systems.

#### *Germany/Austria:*

- Regarding work on the roof, the AUVA regulations must be observed in Austria and DGUV1 regulations in Germany.

#### *Switzerland:*

- Regarding work on the roof, the SUVA regulations must be observed.

**On-roof connection**

**Table 1** shows the maximum permitted snow and wind load depending on the rafter distances. The values must be checked according to local conditions and calculated by a recognised statics/structural engineer. Consequently, no legal claims can be asserted on this basis.

Table 1	Rafter spacing 1000 mm		Rafter spacing 900 mm		Rafter spacing 700-800 mm		Rafter spacing 500-600 mm	
	max. snow load [kN/m <sup>2</sup> ]	max. wind load [kN/m <sup>2</sup> ]	max. snow load [kN/m <sup>2</sup> ]	max. wind load [kN/m <sup>2</sup> ]	max. snow load [kN/m <sup>2</sup> ]	max. wind load [kN/m <sup>2</sup> ]	max. snow load [kN/m <sup>2</sup> ]	max. wind load [kN/m <sup>2</sup> ]
<b>Roof bar set tile adjustable</b>								
AD0V	1.0	0.6	1.0	0.7	1.3	0.7	1.0	0.7
AD20-45V		not permissible			1.2	0.7	1.0	0.7
AD0H	1.0	0.5	0.5	0.5	1.1	0.7	0.7	0.7
AD20-45H		not permissible			1.0	0.7	0.7	0.7
<b>Roof bar set tile heavy duty</b>								
AD0V	1.0	1.0	1.4	1.0	2.3	1	2.8	1.0
AD20-45V		not permissible			1.7	0.8	2.0	0.8
AD0H	1.8	1.0	0.8	1.0	1.8	1	2.0	1.0
AD20-45H		not permissible			1.5	0.8	1.5	0.8
<b>Roof bar set slate</b>								
AD0V		not permissible			1.1	0.7	1.0	0.7
AD0H		not permissible			0.8	0.7	0.9	0.7
<b>Roof bar set plain tile</b>								
AD0V		not permissible			0.2	0.7	0.1	0.7
AD0H		not permissible			0	0.6	0.1	0.7
<b>Hanger bolts</b>								
AD0V		not permissible			0.6	0.7	0.6	0.7
AD0H		not permissible			0.6	0.7	0.6	0.7

**Table 2** shows the calculated minimum number of roof connection sets for the planned number of collectors without taking account of the building-specific anchoring conditions of the roof covering and the building structure. The values must be checked according to local conditions and the status of the roof construction and be calculated by a recognised statics/structural engineer. Consequently, no legal claims can be asserted on this basis.

**Table 2:** Minimum number of roof connection sets (1 set = 2 attachment points)

UltraSol® 2 V	Number of collectors							
	1	2	3	4	5	6	7	8
Rafter spacing 1000 mm	2	3	4	5	7	8	9	10
Rafter spacing 900 mm	2	3	5	6	7	9	10	12
Rafter spacing 800 mm	2	4	5	7	8	10	12	13
Rafter spacing 700 mm	2	4	6	8	9	11	13	15
Rafter spacing 600 mm	2	5	7	9	11	13	15	17
Rafter spacing 500 mm	3	6	8	11	13	16	18	21

**Lengthwise expansion**

Due to high temperature differences between summer and winter, the lengthwise expansion of the profiles must be considered. The carrier profiles must be divided with a gap (min. 4 cm) after every 12 m. Consequently, a maximum of 8 vertical collectors or 6 horizontal collectors can be juxtaposed. The distance between the collector fields is minimum 10 cm.

UltraSol® 2 H	Number of collectors					
	1	2	3	4	5	6
Rafter spacing 1000 mm	3	5	7	10	12	14
Rafter spacing 900 mm	3	5	7	9	11	13
Rafter spacing 800 mm	2	4	6	7	8	10
Rafter spacing 700 mm	3	4	6	8	10	12
Rafter spacing 600 mm	2	4	6	8	10	12
Rafter spacing 500 mm	3	5	7	9	11	13

### Snow load

#### Example for determining the snow load on the collector depending on the collector angle:

AT-6353 Going am Wilden Kaiser, altitude 785 m

- Determination of the characteristic value of snow load  $S_k$  [kN/m<sup>2</sup>] according to EN 1991-1-3  
 Example for *Austria*:  
<https://www.dlubal.com/de/schnee-wind-erdbeben-lastzonen/schnee-onorm-b-1991-1-3.html> or  
<https://www.hora.gv.at/>  
 For AT-6353 Going am Wilden Kaiser, a characteristic snow load of  **$S_k = 4.08$  kN/m<sup>2</sup>** can be expected

For example for *Germany*:

<https://www.dlubal.com/de/schnee-wind-erdbeben-lastzonen/schnee-din-en-1991-1-3.html>

- Example for determining the snow load on the collector depending on the collector angle ( $\alpha$ ).  
 Example for *Austria and Germany*:  
<http://www.renewable-energy-concepts.com/german/sonnenenergie/basiswissen-solarenergie/schneelasten-windlasten.html>

Calculation method:

$$\alpha \leq 30^\circ: S_k(\text{roof}) = S_k(\text{floor}) * 0.8$$

$$30^\circ < \alpha \leq 60^\circ: S_k(\text{roof}) = S_k(\text{floor}) * [0.8 * (60^\circ - \alpha) / 30^\circ]$$

$$\alpha > 60^\circ: S_k(\text{roof}) = 0 \text{ kN/ m}^2$$

At 20° collector angle:  $4.08 \text{ kN/m}^2 * 0.8 = 3.26 \text{ kN/m}^2$   
 At 30° collector angle:  $4.08 \text{ kN/m}^2 * 0.8 = 3.26 \text{ kN/m}^2$   
 At 35° collector angle:  $4.08 \text{ kN/m}^2 * [0.8 * (60^\circ - 35^\circ) / 30^\circ] = 2.72 \text{ kN/m}^2$   
 At 45° collector angle:  $4.08 \text{ kN/m}^2 * [0.8 * (60^\circ - 45^\circ) / 30^\circ] = 1.63 \text{ kN/m}^2$   
 At 60° collector angle:  $4.08 \text{ kN/m}^2 * [0.8 * (60^\circ - 60^\circ) / 30^\circ] = 0 \text{ kN/m}^2$

characteristic value of the snow load $s_k$ [kN/m <sup>2</sup> ] according to EN 1991-1-3:	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	
Snow load on the collector																						
at collector angle less than 30°:	0.8	1.0	1.1	1.3	1.4	1.6	1.8	1.9	2.1	2.2	2.4	2.6	2.7	2.9	3.0	3.2	3.4	3.5	3.7	3.8	4.0	
at 30° collector angle:	0.8	1.0	1.1	1.3	1.4	1.6	1.8	1.9	2.1	2.2	2.4	2.6	2.7	2.9	3.0	3.2	3.4	3.5	3.7	3.8	4.0	
at 35° collector angle:	0.7	0.8	0.9	1.1	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.1	2.3	2.4	2.5	2.7	2.8	2.9	3.1	3.2	3.3	
at 40° collector angle:	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.7	
at 45° collector angle:	0.4	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	
at 50° collector angle:	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	
at 55° collector angle:	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	
at 60° collector angle:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
at collector angle greater than 60°:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

The values from Table 1 On-roof connection can be increased by 40 % (up to max. 4.1 kN/m<sup>2</sup>) by inserting an additional carrier profile (3 carrier profiles in total) as the basic carrier and as the collector carrier.

**Flat roof systems**

**Wind load calculation according to DIN EN 1991-1-3 and -4 for free-standing flat roof systems**

In general, calculation in accordance with standard DIN EN 1991-1-3 and -4 applies for the detailed wind load calculation. The existing recommendation should cover the standard cases and ease handling in daily use. However, this recommendation does not release the planning authority from carefully examining the local conditions and having a designated specialist (structural engineer/civil engineer) make a detailed calculation. Consequently, no liability claims can be asserted on this basis.

The following points are decisive for the design of the wind load:

- Collector angle
- Backpressure zone/wind zone
- Terrain category/location
- Height of building above terrain
- Building dimensions/shape
- Roof edge height (attic)
- Distance from collectors to roof edge
- Number of collectors in a row

The more exposed, the more free-standing the building is, the higher are the expected wind loads. In city areas, the buildings are often protected from wind by other neighbouring buildings.

**Minimum requirement - number of additional weights**

**Table 3** shows the additional weights for the UltraSol® 2 concrete base system. The information in the table only refers to these isolated cases. The values do not apply for every situation and must be checked and adjusted to the local situation. Consequently, no legal claims can be asserted on this basis. Higher backpressures and wind speeds must be determined and calculated in accordance with DIN EN 1991-1-3 and -4.

**At total heights above 10 m, additional anchoring is recommended (safety level 2 or 3). Since the collectors can tilt at higher wind loads, it is especially important that the first row of collectors facing the wind be braced.**

The reference value of the backpressure corresponds to the top speed (gusts of a few seconds). Its return period is 50 years. For constructions at locations with unusual wind conditions, for example peaks or ridges, increasing the values should be examined on a case-by-case basis.

**Table 3:** minimum requirement - number of additional weights

Base speed pressure $q_{b,0}$ <sup>1)</sup>	Backpressure	Peak speed (gust speed) $v_p$ <sup>2)</sup>		Number of UltraSol® 2 H per collector row (angle 45°)						
				Up to 2 collectors	Up to 3 collectors	Up to 4 collectors	Up to 5 collectors	Up to 6 collectors	Up to 7 collectors	Up to 8 collectors
kN/m <sup>2</sup>	kN/m <sup>2</sup>	m/s	km/h	Number of additional weights with 50 kg each <sup>3)</sup>						
0.19	0.4	25.3	91	3	3	3	4	4	4	4
0.24	0.5	28.3	102	4	4	5	5	5	5	6
0.29	0.6	31.1	112	5	6	6	7	7	7	7
0.34	0.7	33.6	121	6	7	Detailed determination necessary by structural engineer				
0.38	0.8	35.8	129	Detailed determination necessary by structural engineer						
0.43	0.9	38.7	139	Detailed determination necessary by structural engineer						
0.48	1	40.8	147	Detailed determination necessary by structural engineer						

<sup>1)</sup> Base speed pressure  $q_{b,0}$  according to EN 1991-1-3 and -4

<sup>2)</sup> Peak speed (gust speed)  $v_p$  according to ÖNORM B 1991-1-4

<sup>3)</sup> Specification of additional weights applies per concrete base

Calculation valid for: attic height > 200 mm; coefficient of friction of underlay mat 0.65; roof distances > 1.5 m

**Austria**

**1. Calculating the wind load**

Calculation of the base speed pressure according to ÖNORM B 1991-1-4:

Example for AT: <https://www.dlupal.com/de/schnee-wind-erdbeben-lastzonen/wind-onorm-b-1991-1-4.html>

**Germany**

**1. Calculating the wind load**

Base speeds and speed pressures:

Wind zone	Base wind speed $v_{b,0}$ in m/s	Base speed pressure $q_b$ in kN/m <sup>2</sup>
1	< 22.5	0.32
2	< 25.0	0.39
3	< 27.5	0.47
4	< 30.0	0.56

Example for DE: <https://www.dlupal.com/de/schnee-wind-erdbeben-lastzonen/wind-din-en-1991-1-4.html>

**Determining the terrain category (TC)**

Terrain categories according to DIN EN 1991-1-4:

Terrain category (TC)	Definition
Terrain category I	Open sea; lakes with at least 5 km open area in wind direction; level, flat land without obstacles (not for Austria)
Terrain category II	Terrain with hedges, individual farms, houses or trees, e.g. agricultural area
Terrain category III	Suburbs, industrial or commercial areas; woodland
Terrain category IV	Urban areas where at least 15% of the area is occupied by buildings with an average height exceeding 15 m

**2. Determination of the maximum gust speed**

Gust speed in wind zone 1:

Reference height in metres	GK I in km/h	GK II in km/h	GK III in km/h	GK IV in km/h
0	112	105	100	93
10	136	124	103	93
16	136	124	111	93
20	139	128	115	98

Gust speed in wind zone 2:

Reference height in metres	GK I in km/h	GK II in km/h	GK III in km/h	GK IV in km/h
0	124	117	111	104
10	145	131	114	104
16	152	138	123	104
20	155	142	127	109

Gust speed in wind zone 3:

Reference height in metres	GK I in km/h	GK II in km/h	GK III in km/h	GK IV in km/h
0	137	129	122	114
10	159	144	126	114
16	167	152	135	114
20	170	156	140	119

Gust speed in wind zone 4:

Reference height in metres	GK I in km/h	GK II in km/h	GK III in km/h	GK IV in km/h
0	149	140	133	124
10	174	157	137	124
16	182	166	148	125
20	186	170	153	130

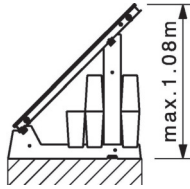
**3. Determination of the minimum number of additional weights per concrete base according to Table 3**

With the value of the maximum gust speed, the number of required additional weights (50 kg each) per concrete base can be calculated. The value in the tables must be above the maximum gust speed of the location.



**Safety levels for fastening and installation conditions**

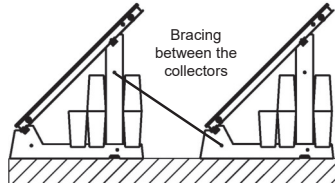
Depending on the building height and situation, the safety of the system must also be increased. The bracing must be created with stable rails or with steel cables.



**Safety level 1**

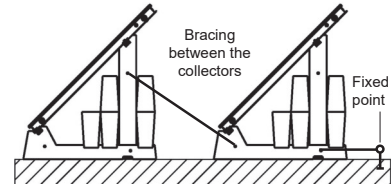
- Increase in dead weight with number of additional weights

M8 threads are moulded on the sides of the concrete base for bracing the collector rows.



**Safety level 2**

- Increase in dead weight with number of additional weights
- Additional fastening of the rows among one another
- Bracing (e.g. perforated rail)
- Recommended if height of building more than 10 m above terrain
- The bracing must be attached to the edge of the collector field. If there are 4 or more collectors in a row, additional bracing must be fitted in the middle of the array



**Safety level 3**

- Increase in dead weight with number of additional weights
- Additional fastening of the rows among one another
- Fastening of rows to a stable fixed point (on-site)
- On-site bracing (e.g. perforated rail)
- Recommended with backpressure of 1.3 kN/m<sup>2</sup> or more, or without roof edge (< 20 cm)

**Substructure of the roof/statics**

Before the weights are positioned on the roof, the statics of the roof must be checked. The responsible structural engineer must be consulted. The compressive strength of the substructure must also be checked. Not every type of insulation is suitable for high point loads. If pallets are delivered to the roof, the permissible loads on the roof must be observed. The following table shows the weights per concrete base depending on the number of additional weights.

Table 4 relates to

- the total weight of the concrete base
- additional weights and
- collector divided by the number of collectors installed in a row

**Weights**

Concrete base: 92 kg  
 Additional weight: 50 kg  
 Collector: 43 kg  
 Concrete base contact surface: 0.2 m<sup>2</sup>

The following number of concrete bases are included in the calculation per row: Number of collectors + 1

If the point load on the structure is too high, the weight can be distributed over a larger area using a load distribution plate under the base.

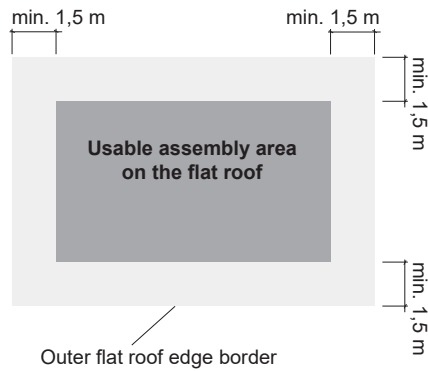
Table 4

	Number of collectors/row							
	1	2	3	4	5	6	7	8
with 3 additional weights	527	406	366	346	333	325	320	315
with 4 additional weights	627	481	432	408	393	384	377	372
with 5 additional weights	727	556	499	471	453	442	434	428
with 6 additional weights	827	631	566	533	513	500	491	484
with 7 additional weights	927	706	632	596	573	559	548	540

### Flat roof edge border zones

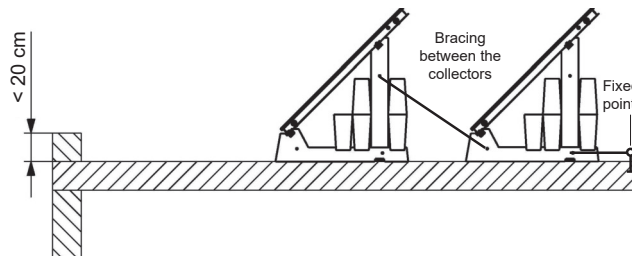
To prevent impermissible wind suction loads, the collectors must not be installed near the edges of the roof. The relevant standards must be observed in this case.

When installing solar collectors, the critical areas near the edge must not be used as assembly areas.



### Flat roof systems without roof edge border

In systems that have no or little flat roof edge border (height less than 20 cm), particular caution is recommended. In this case, the entire construction is exposed to the complete wind forces. That is why we recommend safety level 3 (bracing rows and fastening to a stable fixed point).



### Protection of the roof layer

The flat roof must be protected against damage. Damage to the roof cladding is time-consuming and very cost-intensive to repair. The roof must therefore be thoroughly cleaned before installation. Especially pointed objects such as stones, shards and tools must be removed. The gravel covering must be completely removed in the area of the concrete base. Under the base, the roof cladding must be protected with an insulating mat (e.g. foam rubber mat).

**Recommended pipe dimension (copper or stainless steel pipe)**

for monopropylene glycol/water mixture 40/60 % and 50 °C

Volume flow		DN 10 12 x 1 mm		DN 12 15 x 1 mm		DN 15 18 x 1 mm		DN 20 22 x 1 mm		DN 25 28 x 1.5 mm		DN 32 35 x 1.5 mm		DN 40 42 x 1.5 mm	
[l / h]	[l/min]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
125	2.08	0.44	3.10	0.26	1.10	0.17	0.50	0.11	0.20	0.07	0.10	0.04	0.00	0.03	0.00
150	2.50	0.53	6.70	0.31	1.30	0.21	0.60	0.13	0.20	0.08	0.10	0.05	0.00	0.03	0.00
175	2.92	0.62	8.70	0.37	1.50	0.24	0.70	0.15	0.30	0.10	0.10	0.06	0.00	0.04	0.00
200	3.33	0.71	10.90	0.42	3.20	0.28	0.80	0.18	0.30	0.11	0.10	0.07	0.00	0.05	0.00
250	4.17	0.88	15.90	0.52	4.60	0.35	1.70	0.22	0.40	0.14	0.20	0.09	0.10	0.06	0.00
300	5.00	1.06	21.70	0.63	6.30	0.41	2.40	0.27	0.80	0.17	0.20	0.10	0.10	0.07	0.00
350	5.83	1.24	28.30	0.73	8.20	0.48	3.10	0.31	1.10	0.20	0.20	0.12	0.10	0.08	0.00
400	6.67	1.41	35.60	0.84	10.30	0.55	3.90	0.35	1.40	0.23	0.50	0.14	0.10	0.09	0.00
450	7.50	1.59	43.60	0.94	12.60	0.62	4.70	0.40	1.70	0.25	0.60	0.16	0.10	0.10	0.00
500	8.33	1.77	52.40	1.05	15.10	0.69	5.70	0.44	2.00	0.28	0.70	0.17	0.20	0.12	0.10
600	10.00	2.12	71.90	1.26	20.70	0.83	7.80	0.53	2.70	0.34	0.90	0.21	0.30	0.14	0.10
700	11.67	2.48	94.10	1.46	27.10	0.97	10.10	0.62	3.50	0.40	1.20	0.24	0.40	0.16	0.20
800	13.33	2.83	118.90	1.67	34.10	1.11	12.70	0.71	4.40	0.45	1.50	0.28	0.50	0.19	0.20
900	15.00	3.18	146.20	1.88	41.90	1.24	15.60	0.80	5.40	0.51	1.90	0.31	0.60	0.21	0.20
1000	16.67	3.54	175.90	2.09	50.40	1.38	18.80	0.88	6.50	0.57	2.30	0.35	0.70	0.23	0.30
1200	20.00	4.24	242.60	2.51	69.30	1.66	25.80	1.06	8.90	0.68	3.10	0.41	1.00	0.28	0.40
1500	25.00	5.31	360.20	3.14	102.70	2.07	38.10	1.33	13.20	0.85	4.60	0.52	1.40	0.35	0.60
1750	29.17	6.19	473.70	3.66	134.80	2.42	50.00	1.55	17.30	0.99	6.00	0.60	1.90	0.41	0.70
2000	33.33	7.07	601.00	4.19	170.70	2.76	63.30	1.77	21.80	1.13	7.60	0.69	2.30	0.47	0.90
2250	37.50	7.96	741.90	4.71	210.40	3.11	77.90	1.99	26.90	1.27	9.30	0.78	2.90	0.52	1.10
2500	41.67	8.84	896.00	5.23	253.70	3.45	93.90	2.21	32.30	1.41	11.20	0.86	3.50	0.58	1.40
2750	45.83	9.73	1063.00	5.76	300.70	3.80	111.10	2.43	38.20	1.56	13.20	0.95	4.10	0.64	1.60
3000	50.00	10.61	1243.00	6.28	351.20	4.14	129.70	2.65	44.60	1.70	15.40	1.04	4.70	0.70	1.90

V = Flow speed [m/s]

Δp = Pressure drop [mbar/m]

= Recommended pipe dimension

We recommend using commercially available copper and stainless steel pipe as the pipe raw material,

Heat insulation - depending on installation orientation:

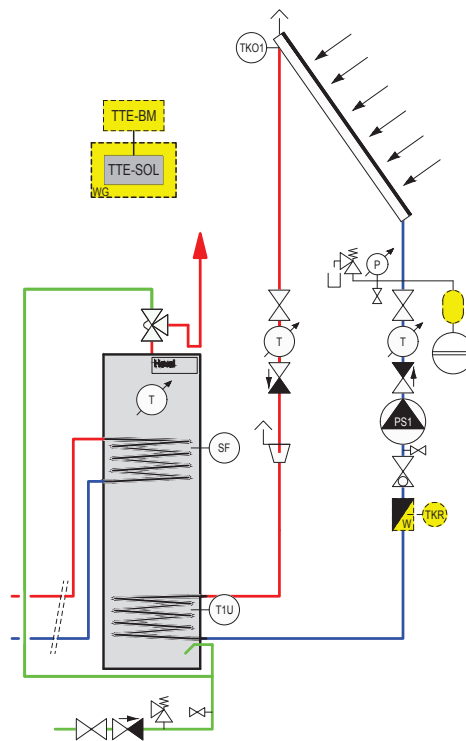
- In the outdoor area, UV radiation resistant and robust (temperature, small animals)
- In the indoor area, depending on requirement, provide with fire and/or with touch protection

**Table does not apply for corrugated tube.**

Further information see solar cable SL

**Solar system for hot water with**

- calorifier
  - solar return armature group
- Hydraulic schematic BAAE020**



**Important notices**

- The example schematics merely show the basic principle and do not contain all information required for installation. Installation must be carried out according to the conditions on site, dimensioning and local regulations.
- With underfloor heating, a flow temperature monitor must be installed.
- Shut-off devices to the safety equipment (pressure expansion tank, safety valve, etc.) must be secured against unintentional closing!
- Mount bags to prevent single pipe gravity circulation!

- TTE-SOL TopTronic® E solar module
- SF Calorifier sensor
- TKO1 Collector sensor 1
- T1U Storage tank sensor
- PS1 Solar circuit pump

*Option*

- TTE-BM TopTronic® E control module
- WG Wall casing
- TKR Return sensor