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) 1009 kWh/collector

Delivery UltraSol®, UltraSol® eco

- max. 10 pcs. upright on each pallet

Solarkeymark-certified

Certifications

Hoval UltraSol® 2	*Solar Keymark* 011-7S2954 F

Model range

UltraSol® 2 type	Installation	Gross collector surface area m²	Absorber surface area/ Aperture surface m²
UltraSol® 2 V	vertical	2.53	2.33
UltraSol® 2 H	horizontal	2.53	2.33

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

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-resistant and PVC-free protective sleeve
- Pipe system for endless laying, for quick and easy installation

Delivery

Solar cables completely packed

Connection set

- Connection set for connecting the Hoval UltraSol® 2 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) 1009 kWh/collector

Flat collector - vertical installation type

UltraSol® type	Collector surface area Gross m²	Absorber m²	Number of collectors units	Part No.
1V	2.53	2.33	1	6050 633
2V	5.06	4.66	2	6050 634
3V	7.59	6.99	3	6050 635
4V	10.12	9.32	4	6050 636
5V	12.65	11.65	5	6050 637
6V	15.18	13.98	6	6050 638
7V	17.71	16.31	7	6050 639
8V	20.24	18.64	8	6050 640
9V	22.77	20.97	9	6050 641
10V	25.30	23.30	10	6050 642

Flat collector - horizontal installation type

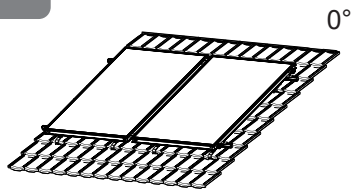
UltraSol® eco type	Collector surface area Gross m²	Absorber m²	Number of collectors units	Part No.
1H	2.53	2.33	1	6050 643
2H	5.06	4.66	2	6050 644
3H	7.59	6.99	3	6050 645
4H	10.12	9.32	4	6050 646
5H	12.65	11.65	5	6050 647
6H	15.18	13.98	6	6050 648
7H	17.71	16.31	7	6050 649
8H	20.24	18.64	8	6050 650
9H	22.77	20.97	9	6050 651
10H	25.30	23.30	10	6050 652

Installation set
See following pages

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

On-roof installation

0°



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

Notice
Collector connections and roof connection of collector, see following pages

Substructure and hydraulic collector connections
(without roof connection and collector connections of collector)

Substructure and hydraulic collector connections for on-roof mounting vertical 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

for number of collectors vertical per collector field units	Installation set	Part No.
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

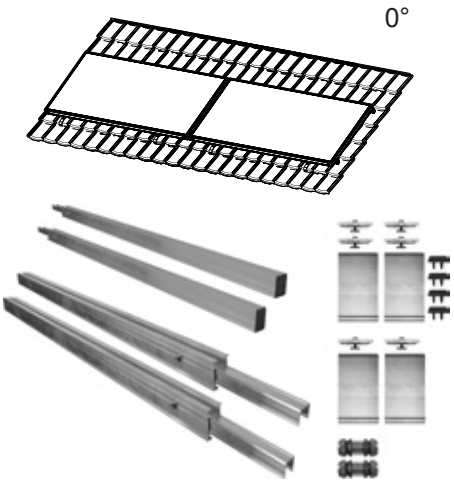
Extra 3rd support section
for Hoval flat collectors UltraSol® 2 for on-roof installation vertical (AD0V) parallel to the roof
For increased snow loads up to 5.6[1)] kN/m²
Consisting of:
- Support sections (collector supports)
- US2 collector clamps cpl.

for number of collectors vertical per collector field units	Installation set	Part No.
1	AD0V-1	6052 933
2	AD0V-2	6052 934
3	AD0V-3	6052 935
4	AD0V-4	6052 936
5	AD0V-5	6052 937
6	AD0V-6	6052 938
7	AD0V-7	6052 939
8	AD0V-8	6052 940

[1)] Depending on rafter spacing, roof connection and roof pitch. See engineering notes

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

On-roof installation



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

Notice
Collector connections and roof connection of collector, see following pages

Substructure and hydraulic collector connections
(without roof connection and collector connections of collector)

Substructure and hydraulic collector connections for on-roof mounting 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

for number of collectors horizontal per collector field units	Installation set	Part No.
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

Extra 3rd support section
for Hoval flat collectors UltraSol® 2 for on-roof installation horizontal
(AD0V) parallel to the roof.
For increased snow loads up to 5.6[1] kN/m²
Consisting of:
- Support sections (collector supports)
- US2 collector clamps cpl.

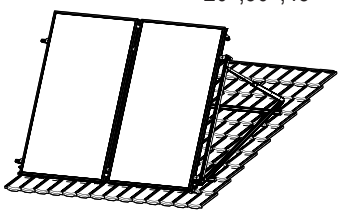
for number of collectors horizontal per collector field units	Installation set	Part No.
1	AD0H-1	6052 941
2	AD0H-2	6052 942
3	AD0H-3	6052 943
4	AD0H-4	6052 944
5	AD0H-5	6052 945
6	AD0H-6	6052 946

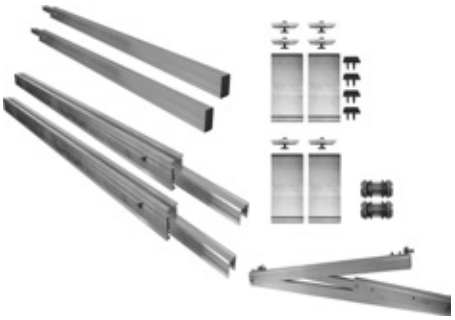
[1] Depending on rafter spacing, roof connection and roof pitch. See engineering notes

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

On-roof installation

20°,30°,45°





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

Notice
Collector connections and roof connection of collector, see following pages

Substructure and hydraulic collector connections
(without roof connection and collector connections of collector)

Substructure and hydraulic collector connections for on-roof mounting vertical 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

for number of collectors vertical per collector field units	Installation set	Part No.
1	AD20-45V-1	6051 257
2	AD20-45V-2	6051 258
3	AD20-45V-3	6051 259
4	AD20-45V-4	6051 260
5	AD20-45V-5	6051 261
6	AD20-45V-6	6051 262
7	AD20-45V-7	6051 263
8	AD20-45V-8	6051 264

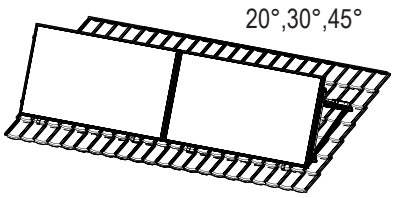
Extra 3rd support section
for Hoval flat collectors UltraSol® 2 for on-roof installation 20°,30°,45° vertical (AD20-45V) to the roof.
For increased snow loads up to 5.6[1] kN/m²
Consisting of:
- Support sections (collector supports)
- US2 collector clamps cpl.
- Cross-connector for support profiles

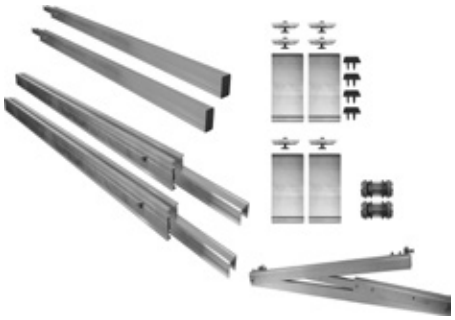
for number of collectors vertical per collector field units	Installation set	Part No.
1	AD20-45V-1	6052 947
2	AD20-45V-2	6052 948
3	AD20-45V-3	6052 949
4	AD20-45V-4	6052 950
5	AD20-45V-5	6052 951
6	AD20-45V-6	6052 952
7	AD20-45V-7	6052 953
8	AD20-45V-8	6052 954

[1] Depending on rafter spacing, roof connection and roof pitch. See engineering notes

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

On-roof installation





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

Notice
Collector connections and roof connection of collector, see following pages

Substructure and hydraulic collector connections
(without roof connection and collector connections of collector)

Substructure and hydraulic collector connections for on-roof mounting 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

for number of collectors horizontal per collector field units	Installation set	Part No.
1	AD20-45H-1	6051 265
2	AD20-45H-2	6051 266
3	AD20-45H-3	6051 267
4	AD20-45H-4	6051 268
5	AD20-45H-5	6051 269
6	AD20-45H-6	6051 270

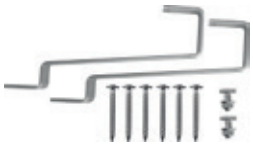
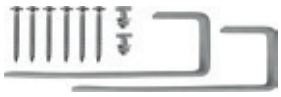
Elevation horizontal 60° see accessories

Extra 3rd support section
for Hoval flat collectors UltraSol® 2 for on-roof installation 20°,30°,45°,60° horizontal (AD20-45H) to the roof.
For increased snow loads up to 5.6[1)] kN/m²
Consisting of:
- Support sections (collector supports)
- US2 collector clamps cpl.
- Cross-connector for support profiles

for number of collectors horizontal per collector field units	Installation set	Part No.
1	AD20-45H-1	6052 955
2	AD20-45H-2	6052 956
3	AD20-45H-3	6052 957
4	AD20-45H-4	6052 958
5	AD20-45H-5	6052 959
6	AD20-45H-6	6052 960

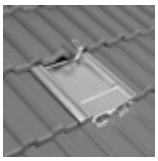
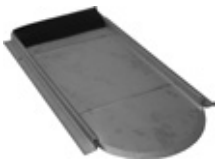
[1)] Depending on rafter spacing, roof connection and roof pitch. See engineering notes

Roof connections for on-roof installation

		Part No.
	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 2 mm** for levelling the roof bars	2061 367
	**Packing plate 3 mm** 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

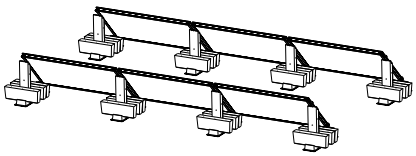
		Part No.
	**Clamp set tin roof clamp** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 Consisting of: - 2 tin roof clamps - Installation set T-head bolt	6037 770
	**Hanger bolt set individual** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 Consisting of: - 2 hanger bolts M12 - 2 quick-mount adapters M12 cpl.	6037 771
	**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	6037 772
	**Screw set concrete base** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 Consisting of: - 2 threaded rod M10 x 150 - 2 quick-mount adapters M10 cpl.	6037 775

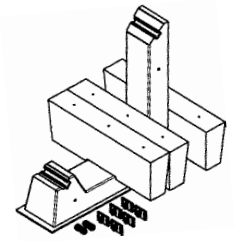
Metal tiles and roof bushings for concrete, clay and plain tiles

		Part No.
	**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

Installation sets
Flat roof installation concrete base
side-by-side, horizontal

Flat roof-mounting
Concrete base





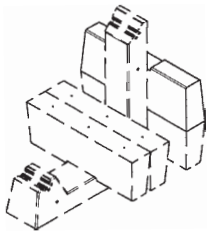
Flat roof - concrete base
45°, horizontal
- for Hoval flat collectors UltraSol® 2 H, UltraSol® eco H
- for flat roof installation 45°
- with concrete base

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

Notice regarding mounting sets FDBS45H and additional weight
The additional weights included in the standard set are not sufficient for every application (see engineering guidelines). Exactly determining the additional weights requires an assessment for the specific building and situation, and calculation of the wind load.
In addition, the maximum roof load must be checked by the structural engineer/civil engineer.

for number of collectors per collector field units	Installation set	Part No.
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 2075 124
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
Max. 7 additional weights/concrete base
Installation area (L x W): approx. 200 x 100
Dimensions (L x W x H):
740 x 130 x 250
Additional weight approx. 50 kg

Solar cables

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

Solar cable type	Nominal pipe width	Length m	Part No.
SL 1515	DN 15	15	2054 140
SL 1520	DN 15	20	2054 141
SL 1525	DN 15	25	2054 142
SL 2015	DN 20	15	2054 143
SL 2020	DN 20	20	2054 154
SL 2025	DN 20	25	2054 155
SL 2515	DN 25	15	2054 156
SL 2520	DN 25	20	2054 157
SL 2525	DN 25	25	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

Dimension solar line stainless steel corrugated tube	Part No.
DN 15	6051 315
DN 20	6051 316
DN 25	6051 317

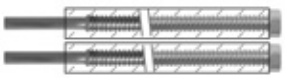
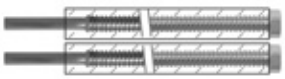
Hydraulics basic set GS 18-¾″ ET FS90 6051 314
for hydraulic connection of a collector field to connection fitting ¾″ external thread flat sealing.
Consisting of:
- 2 connection brackets 90°, 18-¾″ external thread flat sealing
- 1 vent plug
- 1 dummy plug
- 2 flat seals

Collector connections:
- Ø 18 mm Cu round pipe

Hydraulics basic set GS 18-¾″ ET FS 6051 313
for hydraulic connection of a collector field to connection fitting ¾″ external thread flat sealing.
Consisting of:
- 2 straight connection fittings, 18-¾″ external thread flat sealing
- 1 vent plug
- 1 dummy plug
- 2 flat seals

Collector connections:
- Ø 18 mm Cu round pipe

Solar cables

		Part No.
	**Connection set armature group flow/return** for connecting the Hoval solar cables to a solar armature group ¾″ (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).	
	Dimension solar line stainless steel corrugated tube: DN 15 — Connection fitting: R ¾″	6026 411
	DN 20 — R ¾″	6026 412
	DN 25 — R ¾″	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	
	Dimension solar line stainless steel corrugated tube: DN 15	6042 233
	DN 20	6042 234
	DN 25	6042 235
	**Connection coupling** for extending the solar cable	
	Dimension solar line stainless steel corrugated tube: DN 15 — Typ: VKSL15	2054 159
	DN 20 — VKSL20	2054 160
	DN 25 — VKSL25	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, ¾″ 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, ¾″ or 22 x 1 x 100 mm copper solder bush, L = 3000 mm	2062 006
	**Transition screw connection to connection set WES** Compression fitting ¾″ external thread fits 22 x 1 mm copper end piece for further installation with steel pipe Price includes 2 pieces	2054 163

		Part No.
	**Hydraulic connection** for collector field distance max. 30 cm Consisting of: 2 corrugated tubes DN 20 insulated L = 500 mm on both sides ¾″ connection with seal 2 connection brackets 90° ¾″	6051 202
	**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	6051 318
	**Lock set VS-US2** for hydraulic closure of a collector field. - 1 vent plug - 1 dummy plug Collector connections: - Cu round pipe Ø 18 mm	6051 232
	**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 Dimension solar line stainless steel corrugated tube	
	DN 15 DN 20 DN 25	6051 322 6051 323 6051 324
	**Connection set AS-US2 18-¾″ ET FS** for hydraulic connection of a collector field to connection fitting ¾″ external thread flat sealing. Consisting of: - 2 straight connection fitting, 18-¾″ external thread flat sealing - 2 flat seal Collector connections: - Cu round pipe Ø 18 mm	6051 320
	**Connection set AS-US2 18-¾″ ET FS90** for hydraulic connection of a collector field to connection fitting ¾″ external thread flat sealing. Consisting of: - 2 connection brackets 90°, 18-¾″ external thread flat sealing - 2 flat seals Collector connections: - Ø 18 mm Cu round pipe	6051 321

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

DN	Measuring range l/min	Connection Rp x Rp	kvs m³/h	Part No.
20	2-12	¾″ x ¾″	2.2	2038 034
20	8-30	¾″ x ¾″	5.0	2038 035
25	10-40	1″ x 1″	8.1	2038 036
32	20-70	1¼″ x 1¼″	17.0	2038 037

Accessories

Frost protection mixture PowerCool DC923-PXL
on basis propylene glycol
mixed with softened water
with corrosion protection
Frost protection: -25 °C
Content plastic container: 30 kg

2077 235

Frost 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

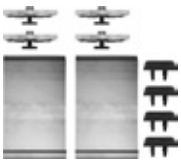
Hand refractometer
for measuring the cloud point of
water-propylene glycol mixtures,
water-ethylene glycol mixtures,
and water-ethanol mixtures
Coolant HighSOL refractive index nD20

2066 933

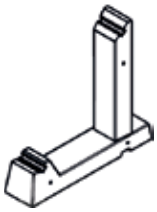
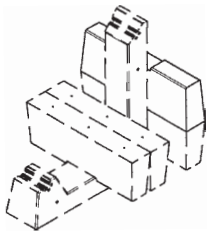
Individual sets/further installation sets

		Part No.
	**Roof bar US2-DBAV - adj. tile** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS	6037 730
	**Roof bar US2-DBCV - tile HD** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS Version stainless steel heavy duty	6037 763
	**Screw set roof bars US2-SHS** 6 x wood screws Torx 8 x 80 st. steel	6037 732
	**Packing plate 2 mm** for levelling the roof bars	2061 367
	**Packing plate 3 mm** for levelling the roof bars	2061 368
	**Hanger bolt US2-ss - individual** M12 x 300 incl. quick-mount adapter incl. EPDM seal	2061 347
	**Double level screw US2-Dss** 2 x M12 x 300 incl. mounting plate incl. EPDM seals	2061 348
	**Roof bar US2-DBC - type plain** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS	2061 344
	**Roof bar US2-DBC - slate** for attaching the carrier profiles for on-roof attachment of UltraSol® 2 1 pce w/o screw set US2-SHS	2061 398
	**Installation set T-head bolt** 2 x bolt and nut	6037 766
	**Clamp US2-BFK - tin joint**	6037 795
	**Quick-mount adapter M10 cpl.** for attaching the carrier profiles	6037 773
	**Quick-mount adapter M12 cpl.** for attaching the carrier profiles	6037 774
	**Hanger bolt M12 x 300 CR** 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

		Part No.
	**Cross-connector cpl.** for attaching the elevation with the carrier profiles	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
	**Collector clamp 5-US2 AD** Individual collector clamp for on-roof installation Consisting of: - 1 US2 collector clamp cpl.	6050 677
	**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

Individual sets concrete base

	Part No.
 **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 Dimensions (L x W x H): 930 x 190 x 865 mm Weight: approx. 92 kg	6050 805
 **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 Max. 7 additional weights/concrete base Installation area (L x W): approx. 200 x 100 Dimensions (L x W x H): 740 x 130 x 250 Additional weight approx. 50 kg	2075 124
Notice regarding concrete base and additional weight Exactly determining the additional weights requires an assessment for the specific building and situation, and calculation of the wind load. In addition, the maximum roof load must be checked by the structural engineer/civil engineer.	
 **Protective mat with aluminum lining** for concrete base for protecting the roof cladding and compensating irregularities Dimensions (L x W x H): 1000 x 260 x 6 mm	2061 579

Services

Commissioning
Commissioning by works service or Hoval trained authorised serviceman/company is condition for warranty.

For commissioning and other services please contact your Hoval sales office.

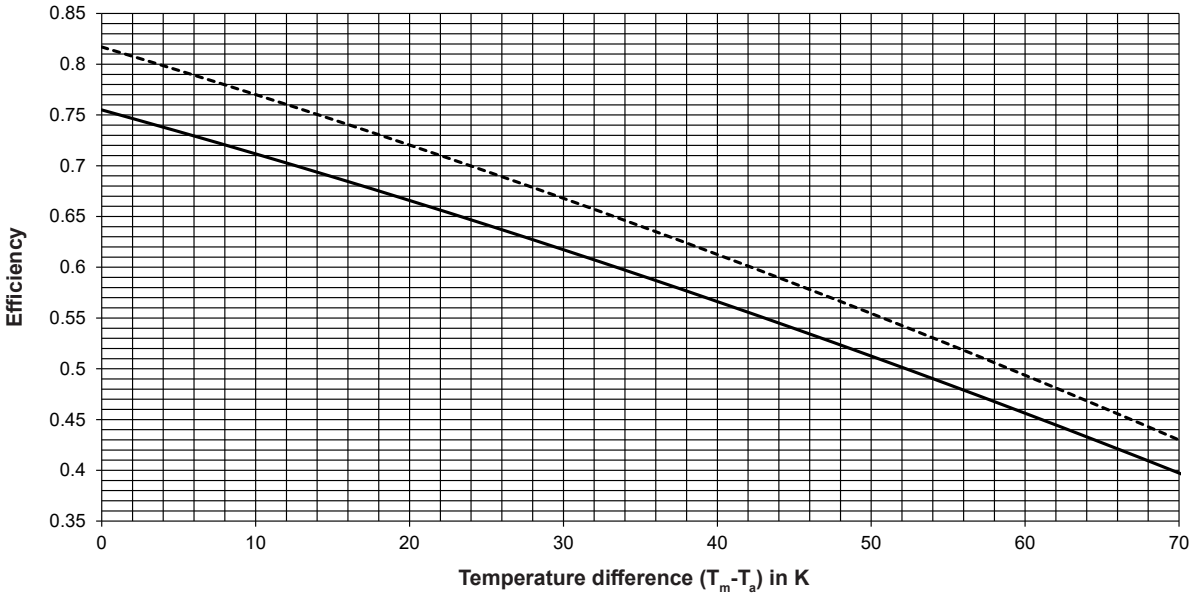
UltraSol® 2

Type		UltraSol® 2	
		V	H
Optical efficiency (aperture surface) $\eta_{0,b}$ [1]	%	81.7	81.7
a_1 [1]	W/(m²K)	4.55	4.55
a_2 [1]	W/(m²K²)	0.014	0.014
Optical efficiency (gross area) $\eta_{0,b}$ [2]	%	75.5	75.5
a_1 [2]	W/(m²K)	4.2	4.2
a_2 [2]	W/(m²K²)	0.013	0.013
Reference surfaces			
• Total surface area	m²	2.53	2.53
• Aperture surface	m²	2.33	2.33
• Absorber surface	m²	2.33	2.33
Collector/casing			
• Design		Extruded sections	
• Length, width, height		see dimensional drawing	
• Material		Aluminium	
• Weight	kg	43	43
Absorber			
• 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	
Glass cover (transparent cover)			
• Product name		Structured toughened safety glass (ESG) with anti-reflective coating on one side	
• Transmission level	%	94	94
• Thickness	mm	3.2	
Thermal insulation			
• Material		Mineral wool	
• Thermal conductivity	W/(m²K)	0.039	0.039
• Thickness	mm	20	20
• Hail resistance class		HW 3 (hailstones of ø up to 30 mm)	
Application limits			
• 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 m²)	15-50	15-50
• Nominal flow per collector approx.	l/h	40-100	40-100
• Min. collector pitch		22°	
• Max. collector pitch		90°	

[1] Peak efficiency of the collector (η_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 m²)

[2] Peak efficiency of the collector (η_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 m²)

Efficiency characteristic curve UltraSol® 2

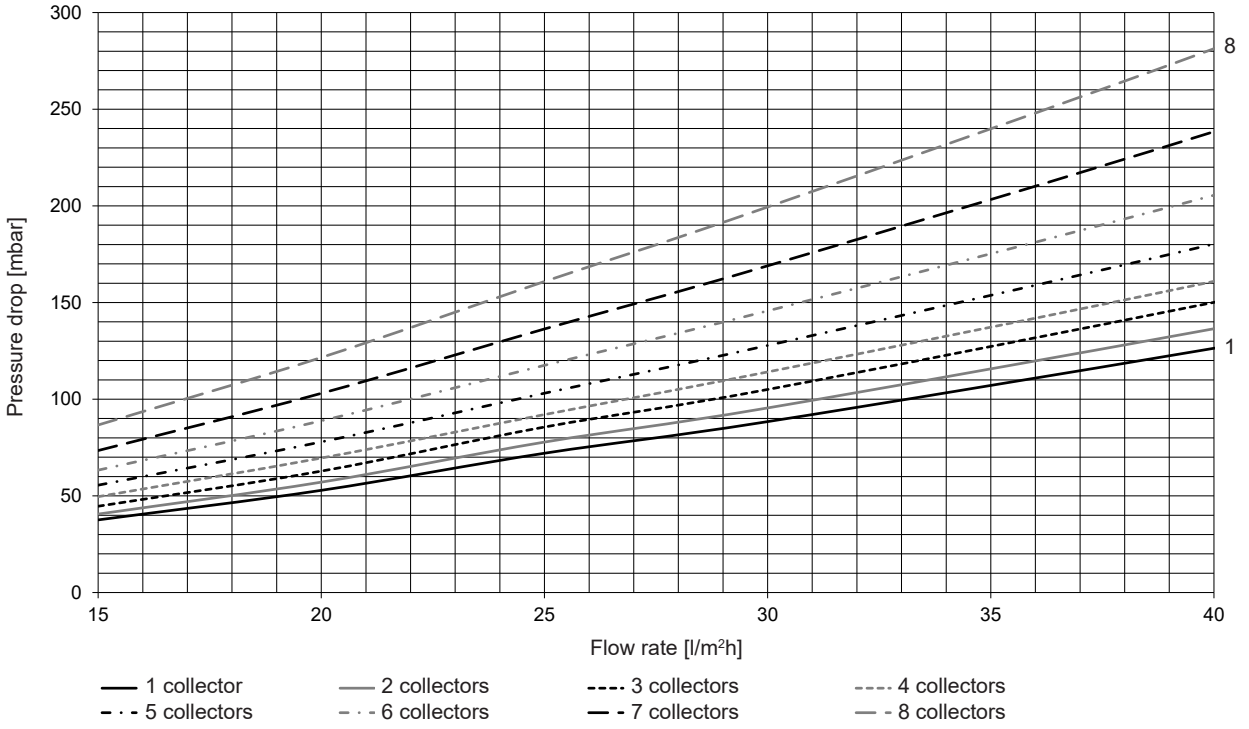


——— UltraSol® 2 (Gross area)
- - - - - - UltraSol® 2 (Aperture surface)

T_m = average collector temperature
T_a = ambient temperature

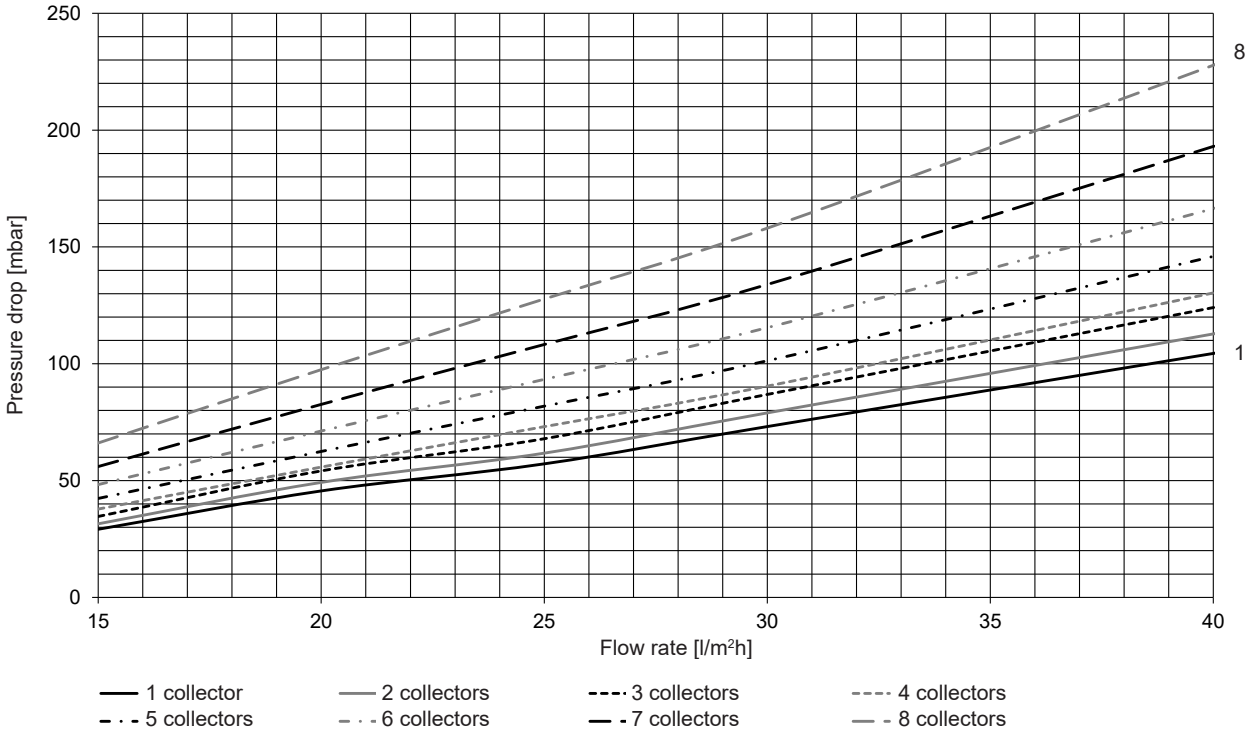
Pressure drop - UltraSol® 2, vertical

Water-Glycol mixture - temp. 20 °C



Pressure drop - UltraSol® 2, horizontal

Water-Glycol mixture - temp. 20 °C

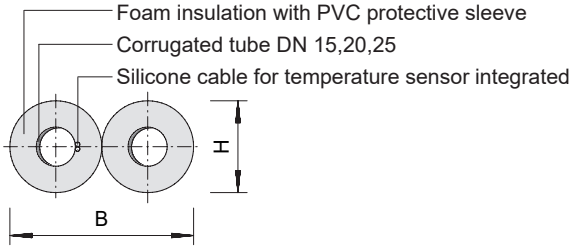


Solar cable SL

- Flexible stainless steel corrugated tube, material 1.4404.
- Max. pressure at 200 °C: 10 bar

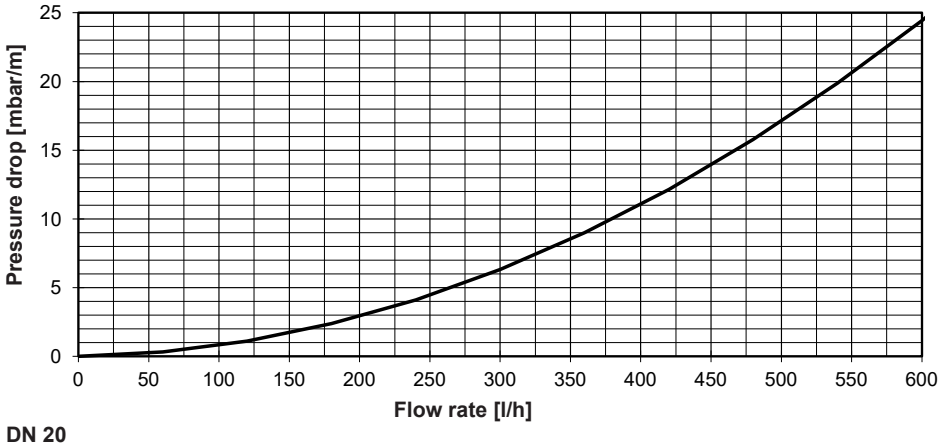
Type	Nominal pipe width		Di	De	Radius	Max. operating pressure	Weight	Wall thickness	Content
	DN	R	mm	mm	mm	bar	kg/m	mm	l/m
SL 15	15	R ½″	16.6	21.4	35	10	0.140	0.18	0.28
SL 20	20	R ¾″	20.6	26.2	40	10	0.195	0.18	0.43
SL 25	25	R 1″	25.6	31.6	50	10	0.235	0.20	0.64

Type	B	H	Insulation thickness
	mm	mm	mm
SL 15	103	51	14
SL 20	125	62	14
SL 25	142	70	20

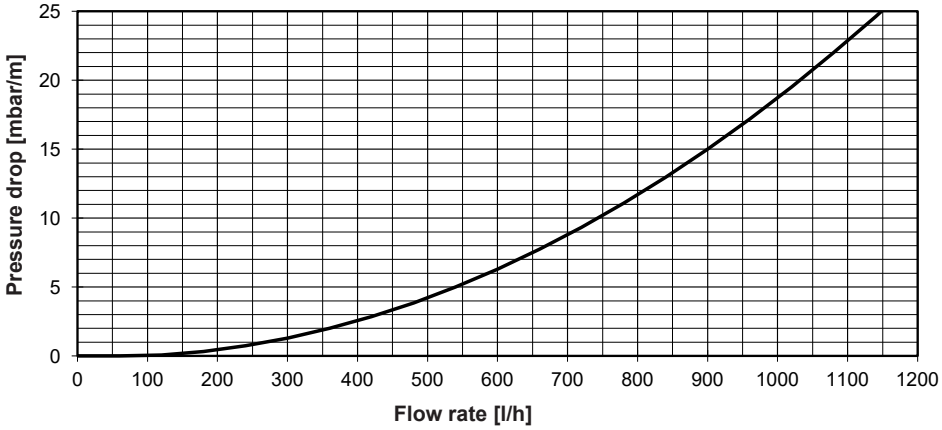


Specific pressure drop value (per metre individual pipe)
Glycol/water mixture 40/60 % and 40 °C

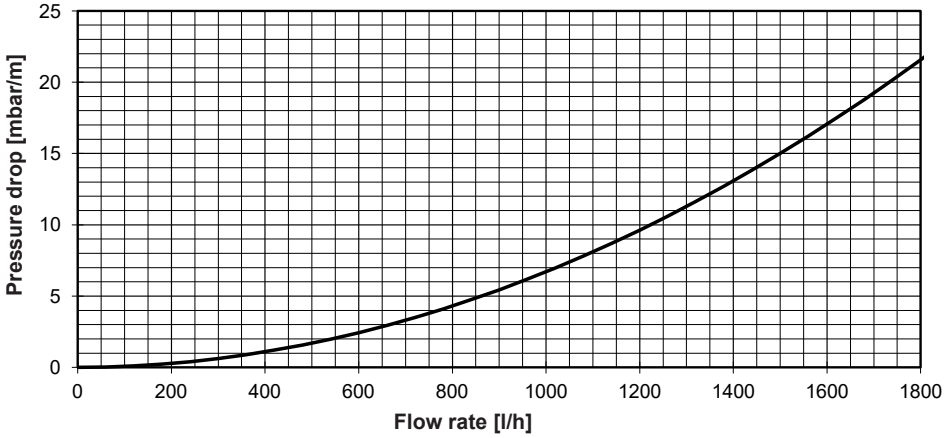
DN 15



DN 20



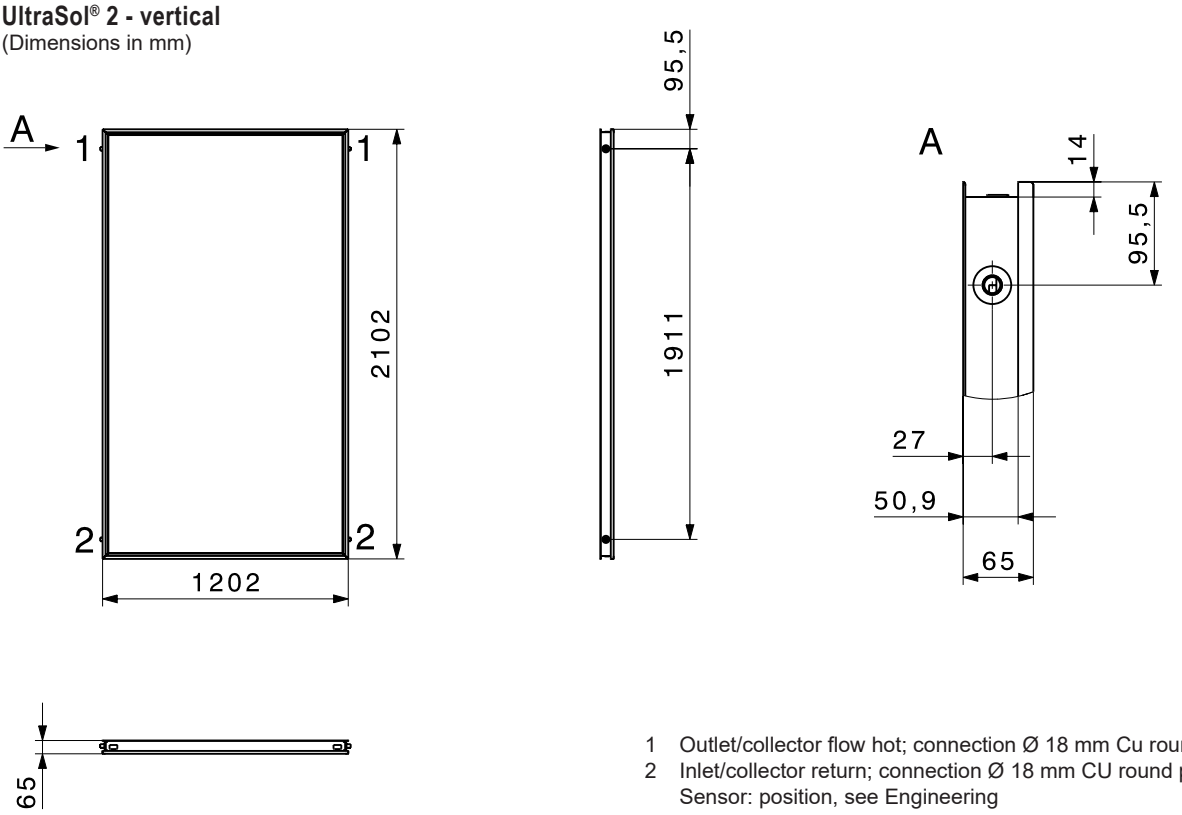
DN 25



1 mbar = 100 Pa = 0.1 kPa

UltraSol® 2 - vertical

(Dimensions in mm)

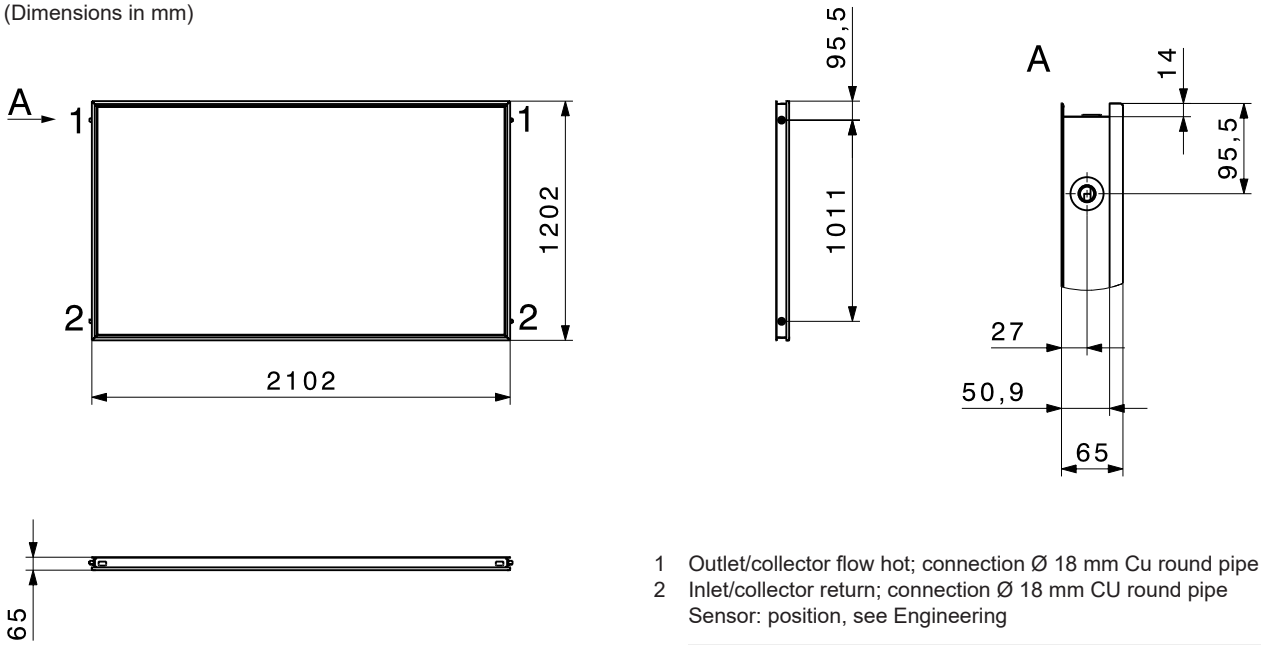


1 Outlet/collector flow hot; connection Ø 18 mm Cu round pipe
2 Inlet/collector return; connection Ø 18 mm CU round pipe
Sensor: position, see Engineering

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

UltraSol® 2 - horizontal

(Dimensions in mm)

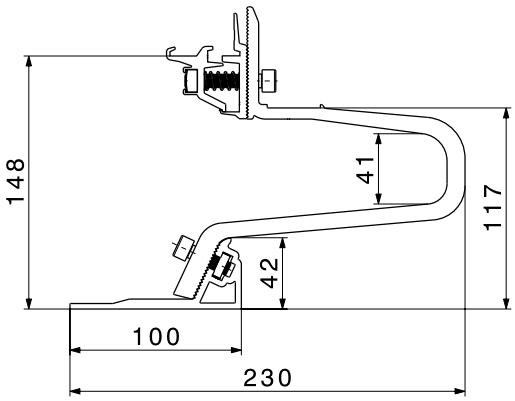


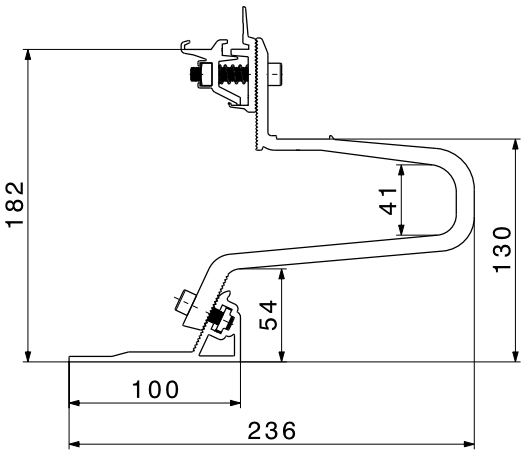
1 Outlet/collector flow hot; connection Ø 18 mm Cu round pipe
2 Inlet/collector return; connection Ø 18 mm CU round pipe
Sensor: position, see Engineering

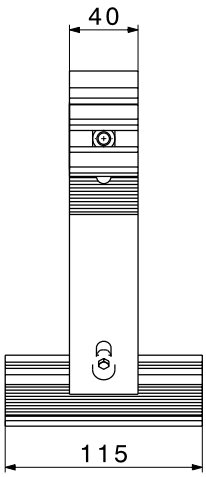
- One-sided connection left or right possible (not Tichelmann)
- Connection on alternating sides possible (Tichelmann)

Roof bar tile adjustable - for on-roof installation

(Dimensions in mm)

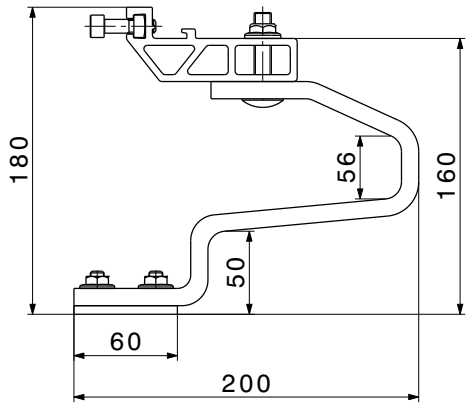


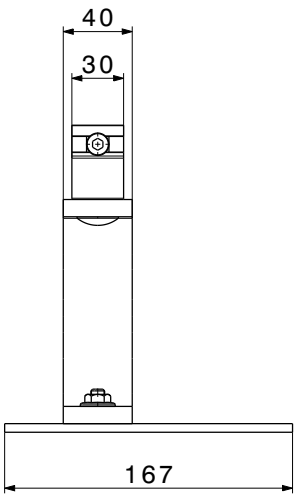


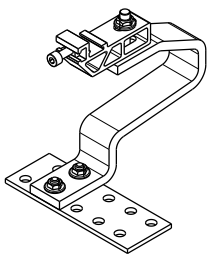


Roof bar tile heavy duty - for on-roof installation

(Dimensions in mm)

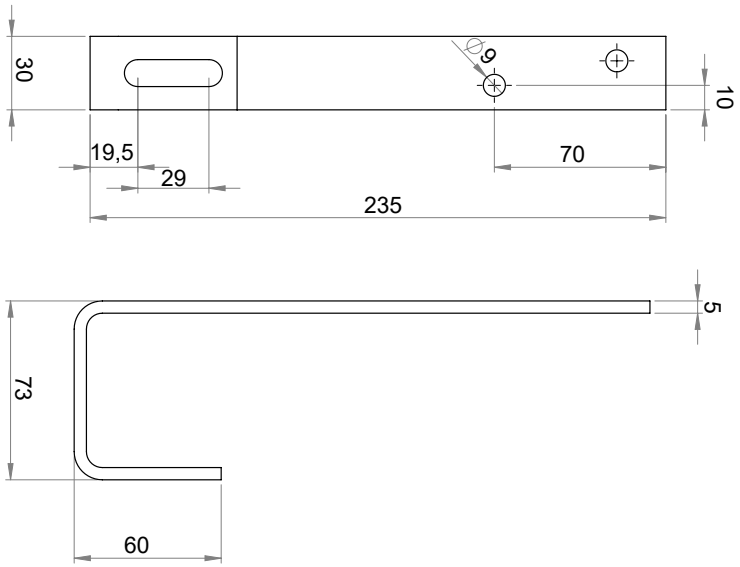






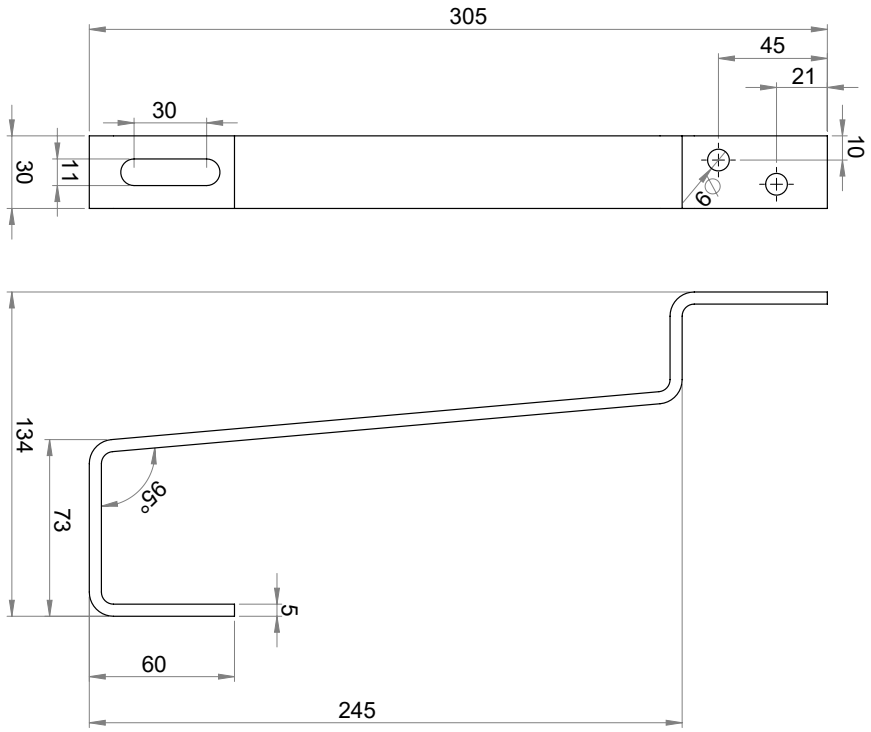
Roof bar slate - for on-roof installation

(Dimensions in mm)



Roof bar plain tile - for on-roof installation

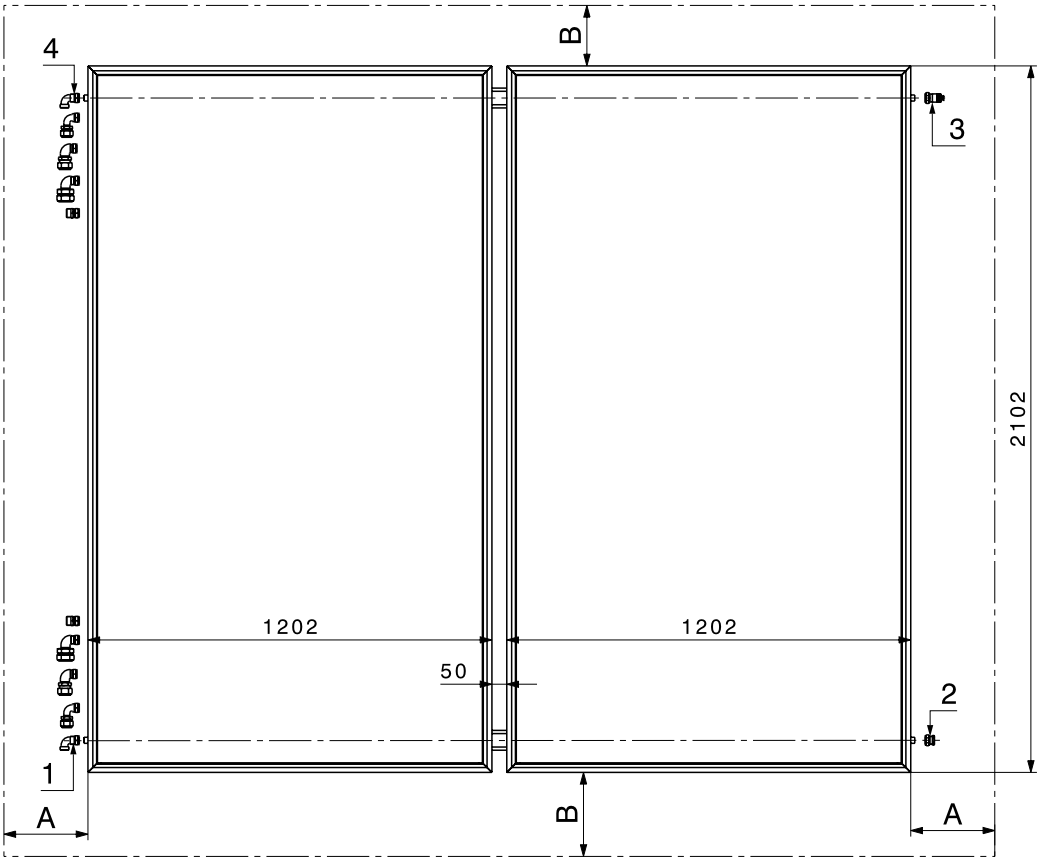
(Dimensions in mm)



Space requirements

UltraSol® 2 - vertical

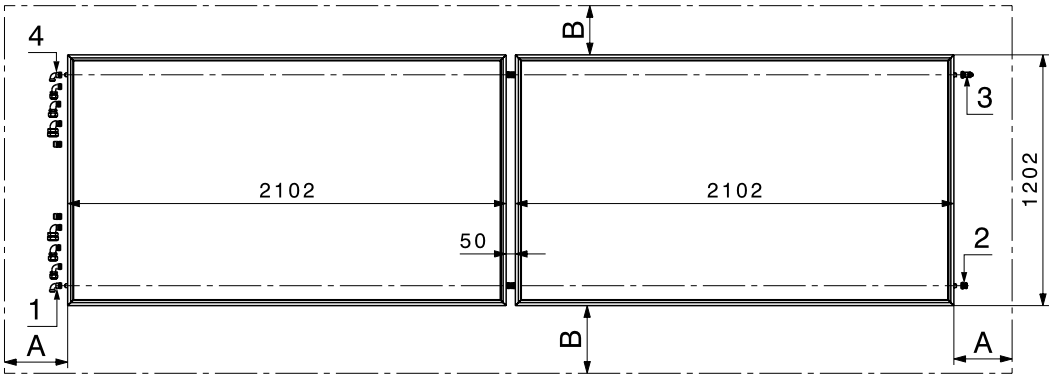
(Dimensions in mm)



Inverted configuration of the connections is also possible.

UltraSol® 2 - horizontal

(Dimensions in mm)



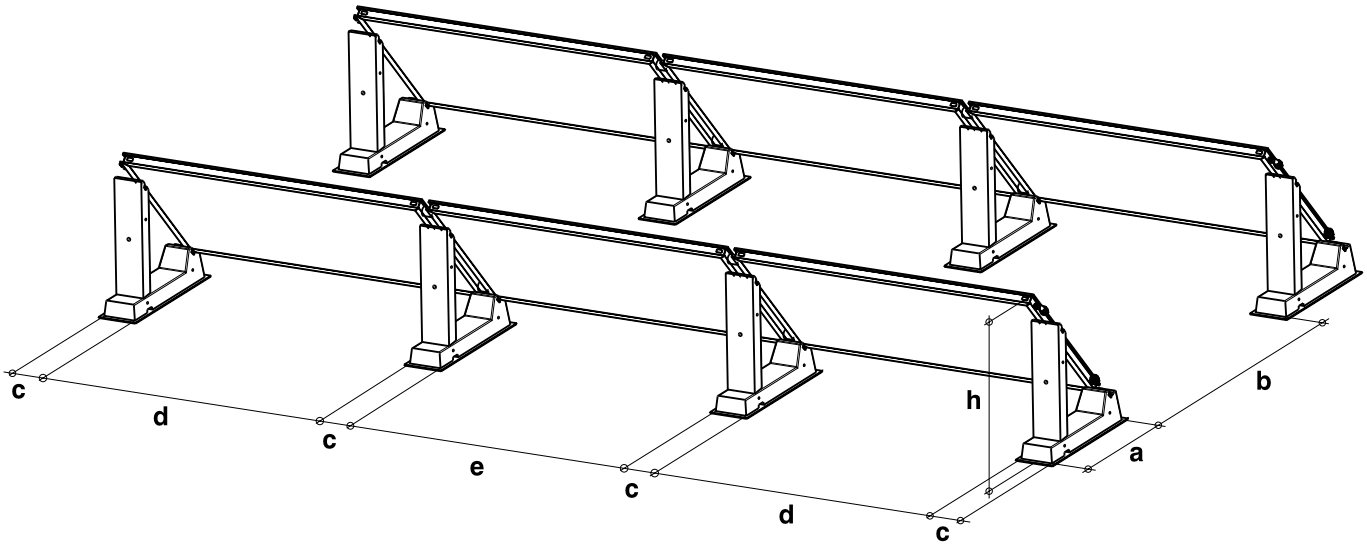
Inverted configuration of the connections is also possible.

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 pipe
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 (roof ridge).
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

Concrete base - installation
(Dimensions in mm)



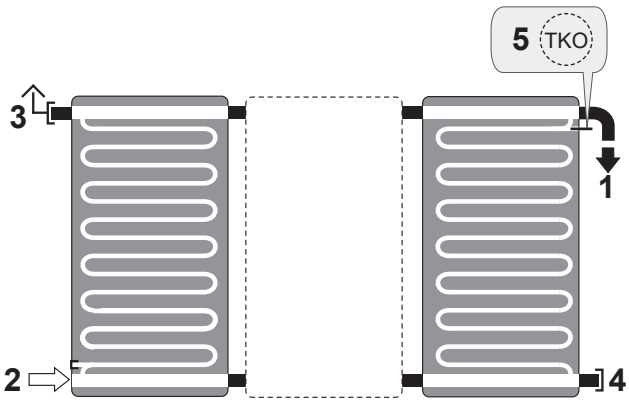
Type	Installation angle	h	a	b	c	d	e
UltraSol® 2	45°	*1083	930	min. 1100	215	1897	1937

* With protective mat

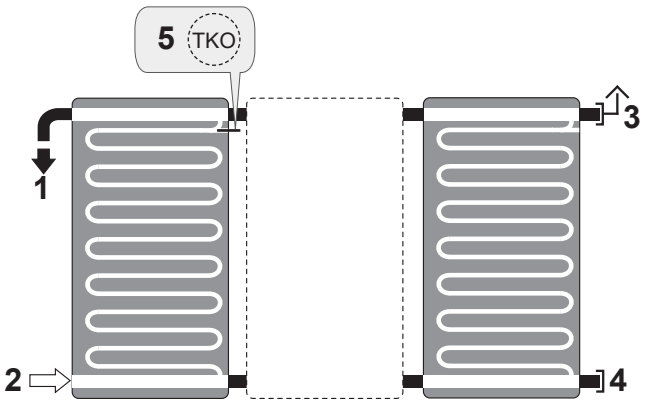
Piping of the collector series
Connection example for collector series

UltraSol® 2 V (collector vertical)

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

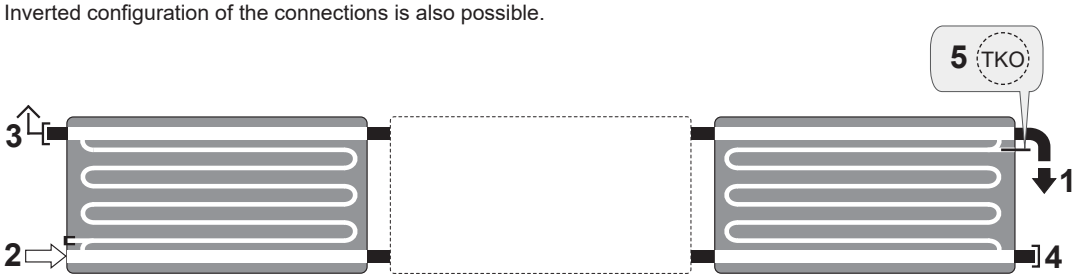


Connection variant: non-Tichelmann, max. 8 collectors/row
Inverted configuration of the connections is also possible..



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)

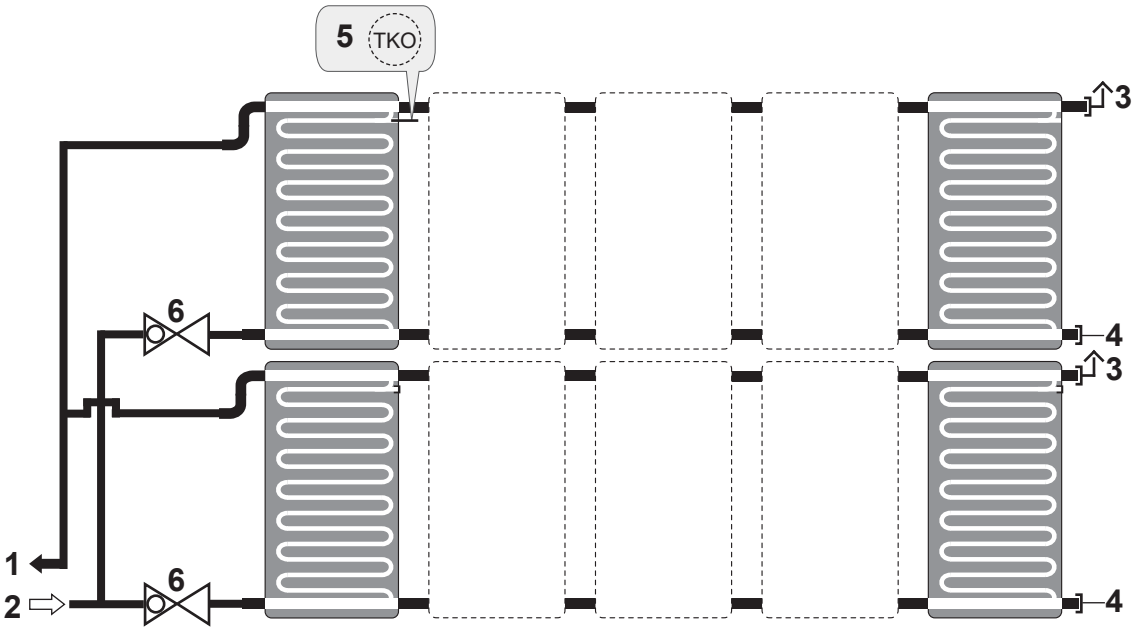
3 Dummy plug with integrated manual vent

4 Dummy plug

5 TKO Immersion sleeve Differential control sensor or solar sensor

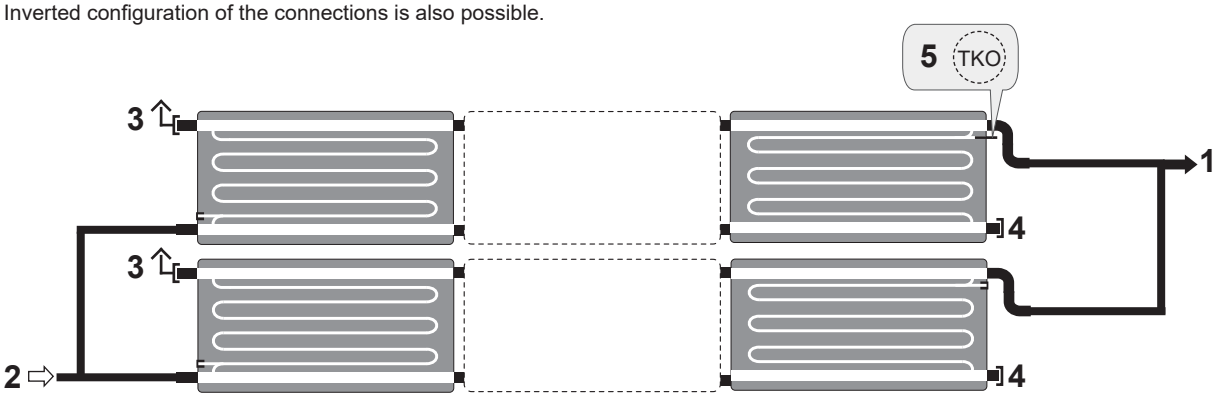
UltraSol® 2 V (collector vertical)

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.
- The snow and wind loads are regulated by DIN EN 1991 and the associated national appendix.
- The European standard EN 1991-1-3 must be observed. It is valid up to altitudes of 1500 m. Any altitudes above that are regulated by special national appendices.

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 been 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 field. If snow guards are mounted on the more elevated roof for this reason, the statics of this roof must be inspected.

Penetrations of the roof cladding (all roof types)

Penetrations of the roof cladding should be avoided wherever possible. If penetrations with mounting elements (e.g. hanger bolts) or other components (e.g. solar lines) cannot be avoided, they must be carried out by experts in accordance with the regionally applicable standards and guidelines:

Germany: DIN 18531
Austria: ÖNORM B 7220
Switzerland: SIA 271
Other regionally applicable directives of the roofing trade must be observed and complied with.

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. Regarding work on the roof, local regulations must be adhered to.

On-roof mounting and flat-roof mounting with elevations

Table 1 shows the max. permissible snow and wind loads (characteristic for the location of the system) for the specified collector inclinations depending on the distance between the fastening points (rafter spacing) and the selected fastening elements. These loads refer to the use of the max. possible number of fixing points, i.e. e.g. when using each rafter.
In the case of elevated installation on a flat roof, the specified rafter distances are to be equated with the distances between the fixing points on the (on-site) substructure. The required number of mounting sets for the planned number of collectors and the mounting distance can be found in Table 2. It must be checked and ensured that the existing roof or substructure on site can absorb the loads occurring and guarantee a secure anchoring of the fastening points. All values given must be checked/calculated by a recognised statics/structural engineer if necessary. Consequently, no legal claims can be asserted on this basis.

The following links can be used to determine the characteristic snow load s_k:

Switzerland:
https://www.dlubal.com/de/schnee-wind-erdbeben-lastzonen/schnee-sia-261.html

Austria:
https://www.dlubal.com/de/schnee-wind-erdbeben-lastzonen/schnee-onorm-b-1991-1-3.html
https://www.hora.gv.at/

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

Liechtenstein:
https://www.dlubal.com/de/schnee-wind-erdbeben-lastzonen/schnee-ll-bauv.html

The minimum permissible inclination of the collector is 22°. For collector inclinations over 60°, a detailed calculation by a statics/structural engineer is necessary.

AD0V: On-roof mounting, 0° (parallel to the roof), collector design V
AD0H: On-roof mounting, 0° (parallel to the roof), collector design H

AD20-45V: On-roof mounting, elevated 20...45° (plus roof pitch), collector design V
AD20-60H: On-roof mounting, elevated 20...60° (plus roof pitch), collector design H

FD20-45V: Flat roof mounting, elevated 20...45°, collector design V
FD20-60H: Flat-roof mounting, elevated 20...60°, collector design H

Table 1

On-roof mounting and flat-roof mounting with elevations
Collector inclination 22...32° to the horizontal
Collector UltraSol® 2 V/H

		2 profile rows standard load					
Rafter spacing	[mm]	≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
max. permissible loads	[kN/m²]	Snow [1]	Wind	Snow [1]	Wind	Snow [1]	Wind
Roof bar tile adjustable US2-DBAV	AD0V	1.6	0.9	1.2	0.7	1.0	0.7
	AD20-45V	1.2	0.7	1.2	0.7	not permissible	
	AD0H	3.6	1.0	2.6	0.9	2.0	0.9
	AD20-45H	1.2	0.7	1.2	0.7	not permissible	
	AD60H	1.2	0.7	1.2	0.7	not permissible	
Roof bar tile heavy duty US2-DBCV	AD0V	2.6	1.0	2.0	0.9	1.6	0.9
	AD20-45V	2.0	0.8	2.0	0.8	not permissible	
	AD0H	5.0	1.5	4.0	0.9	3.5	0.9
	AD20-45H	2.0	0.8	2.0	0.8	not permissible	
	AD60H	2.0	0.8	2.0	0.8	not permissible	
Roof bar plain tile US2-DBC-plain tile [2]	AD0V	1.6	0.9	1.2	0.7	1.0	0.7
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	3.6	1.0	2.6	0.9	2.0	0.9
	AD20-45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	
Roof bar slate US2-DBC-slate [2]	AD0V	1.6	0.9	1.2	0.7	1.0	0.7
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	3.6	1.0	2.6	0.9	2.0	0.9
	AD20-45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	
Hanger bolt	AD0V	1.4	0.9	0.9	0.9	0.6	0.4
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	1.8	0.9	1.2	0.9	0.9	0.9
	AD20-45H	not permissible		not permissible		not permissible	
	FD20-30V	1.4	0.9	0.9	0.9	0.6	0.4
	FD20-30H	1.8	0.9	1.2	0.9	0.9	0.9
Double level screw	AD0V	1.8	0.9	1.2	0.9	1.0	0.9
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	4.0	0.9	2.8	0.9	2.4	0.9
	AD20-45H	not permissible		not permissible		not permissible	
	FD20-30V	1.8	0.9	1.2	0.9	1.0	0.9
	FD20-30H	4.0	0.9	2.8	0.9	2.4	0.9
Tin roof clamp [3]	AD0V	max. perm. load: pressure 2.0 kN - suction 1.5 kN					
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	max. perm. load: pressure 2.0 kN - suction 1.5 kN					
	AD20-45H	not permissible		not permissible		not permissible	

[1] Characteristic snow load s_k
[2] Only in combination with metal tiles
[3] The specified values of the sheet metal seam clamps apply as max. load per clamp. When using sheet metal seam clamps, the load-bearing capacity of the sheet metal seams and the sheet metal roof must be checked on site. The number and distribution of the clamps must be calculated by the customer. All values given must be checked/calculated by a recognised statics/structural engineer if necessary. Elevated mounting with sheet metal seam clamps is not permitted!

On-roof mounting and flat-roof mounting with elevations
Collector inclination 22...32° to the horizontal
Collector UltraSol® 2 V/H

		3 profile rows increased load (statics supplement - extra 3rd support section)					
Rafter spacing	[mm]	≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
max. permissible loads	[kN/m²]	Snow [1]	Wind	Snow [1]	Wind	Snow [1]	Wind
Roof bar tile adjustable US2-DBAV	AD0V	2.8	1.1	2.0	0.9	1.6	0.7
	AD20-45V	1.2	0.7	1.2	0.7	not permissible	
	AD0H	5.5	1.2	4.0	1.1	3.1	1.1
	AD20-45H	1.2	0.7	1.2	0.7	not permissible	
	AD60H	1.2	0.7	1.2	0.7	not permissible	
Roof bar tile heavy duty US2-DBCV	AD0V	4.5	1.1	3.0	1.1	2.3	1.1
	AD20-45V	2.0	0.8	2.0	0.8	not permissible	
	AD0H	5.6	1.2	5.6	1.2	4.8	1.2
	AD20-45H	2.0	0.8	2.0	0.8	not permissible	
	AD60H	2.0	0.8	2.0	0.8	not permissible	

Table 1

On-roof mounting and flat-roof mounting with elevations
Collector inclination 33...60° to the horizontal
Collector UltraSol® 2 V/H

		2 profile rows standard load					
Rafter spacing	[mm]	≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
max. permissible loads	[kN/m²]	Snow [1]	Wind	Snow [1]	Wind	Snow [1]	Wind
Roof bar tile adjustable US2-DBAV	AD0V	1.4	0.7	0.9	0.7	0.8	0.7
	AD20-45V	1.2	0.7	1.2	0.7	not permissible	
	AD0H	2.8	0.9	2.2	0.7	1.6	0.7
	AD20-45H	1.2	0.7	1.2	0.7	not permissible	
	AD60H	1.2	0.7	1.2	0.7	not permissible	
Roof bar tile heavy duty US2-DBCV	AD0V	1.8	0.9	1.2	0.9	1.0	0.9
	AD20-45V	2.0	0.8	2.0	0.8	not permissible	
	AD0H	4.0	0.9	2.8	0.9	2.4	0.9
	AD20-45H	2.0	0.8	2.0	0.8	not permissible	
	AD60H	2.0	0.8	2.0	0.8	not permissible	
Roof bar plain tile US2-DBC-plain tile [2]	AD0V	1.4	0.7	0.9	0.7	0.8	0.7
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	2.8	0.9	2.2	0.7	1.6	0.7
	AD20-45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	
Roof bar slate US2-DBC-slate [2]	AD0V	1.4	0.7	0.9	0.7	0.8	0.7
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	2.8	0.9	2.2	0.7	1.6	0.7
	AD20-45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	
Hanger bolt	AD0V	1.4	0.9	0.9	0.9	0.6	0.4
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	1.8	0.9	1.2	0.9	0.9	0.9
	AD20-45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	
	FD45V	1.4	0.9	0.9	0.9	0.6	0.4
	FD45H	1.8	0.9	1.2	0.9	0.9	0.9
	FD60H	1.8	0.9	1.2	0.9	0.9	0.9
Double level screw	AD0V	1.8	0.9	1.2	0.9	1.0	0.9
	AD20-45V	not permissible		not permissible		not permissible	
	AD0H	4.0	0.9	2.8	0.9	2.4	0.9
	AD20-45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	
	FD45V	1.8	0.9	1.2	0.9	1.0	0.9
	FD45H	4.0	0.9	2.8	0.9	2.4	0.9
	FD60H	4.0	0.9	2.8	0.9	2.4	0.9
Tin roof clamp [3]	AD0V	max. perm. load: pressure 2.0 kN - suction 1.5 kN					
	AD45V	not permissible		not permissible		not permissible	
	AD0H	max. perm. load: pressure 2.0 kN - suction 1.5 kN					
	AD45H	not permissible		not permissible		not permissible	
	AD60H	not permissible		not permissible		not permissible	

[1] Characteristic snow load s_k
[2] Only in combination with metal tiles
[3] The specified values of the sheet metal seam clamps apply as max. load per clamp. When using sheet metal seam clamps, the load-bearing capacity of the sheet metal seams and the sheet metal roof must be checked on site. The number and distribution of the clamps must be calculated by the customer. All values given must be checked/calculated by a recognised statics/structural engineer if necessary. Elevated mounting with sheet metal seam clamps is not permitted!

On-roof mounting and flat-roof mounting with elevations
Collector inclination 33...60° to the horizontal
Collector UltraSol® 2 V/H

		3 profile rows					
		increased load (statics supplement - extra 3rd support section)					
Rafter spacing	[mm]	≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
max. permissible loads	[kN/m²]	Snow [1]	Wind	Snow [1]	Wind	Snow [1]	Wind
Roof bar tile adjustable US2-DBAV	AD0V	2.3	0.9	1.7	0.7	1.2	0.7
	AD20-45V	1.2	0.7	1.2	0.7	not permissible	
	AD0H	4.4	1.1	3.1	1.1	2.3	1.1
	AD20-45H	1.2	0.7	1.2	0.7	not permissible	
	AD60H	1.2	0.7	1.2	0.7	not permissible	
Roof bar tile heavy duty US2-DBCV	AD0V	3.0	1.1	2.2	0.9	1.6	0.9
	AD20-45V	2.0	0.8	2.0	0.8	not permissible	
	AD0H	5.0	1.2	4.1	1.2	4.3	1.2
	AD20-45H	2.0	0.8	2.0	0.8	not permissible	
	AD60H	2.0	0.8	2.0	0.8	not permissible	

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.

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.

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 [1] 1000 mm	2	3	4	5	7	8	9	10
Rafter spacing [1] 900 mm	2	3	5	6	7	9	10	12
Rafter spacing [1] 800 mm	2	4	5	7	8	10	12	13
Rafter spacing [1] 700 mm	2	4	6	8	9	11	13	15
Rafter spacing [1] 600 mm	2	5	7	9	11	13	15	17
Rafter spacing [1] 500 mm	3	6	8	11	13	16	18	21

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

[1] Distance between fixing levels

Snow load

Calculation examples snow load on-roof mounting

	Example 1	Example 2	Example 3	Example 4
Collector angle	30°	45°	35°	45°
On-roof mounting	AD0V: On-roof mounting, 0° (parallel to the roof), collector design V	AD20-45V: On-roof mounting, elevated 20...45° (plus roof pitch), collector design V	AD0H: On-roof mounting, 0° (parallel to the roof), collector design H	AD0H: On-roof mounting, 0° (parallel to the roof), collector design H
Rafter spacing	600 mm	600 mm	800 mm	800 mm
Characteristic snow load s_k	CH-7000 Chur: s_k = 2.46 kN/m²	CH-7000 Chur: s_k = 2.46 kN/m²	AT-6353 Going am Wilden Kaiser: s_k = 4.08 kN/m²	DE-83022 Rosenheim: s_k = 1.39 kN/m²
Permissible roof brackets (see Table 1)	With 2 profile levels (standard load): - Roof bracket tile heavy duty US2-DBCV s_k = 2.6 kN/m²	Not a permissible design	With 3 profile levels (increased load): - Roof bracket tile heavy duty US2-DBCV s_k = 4.1 kN/m²	With 2 profile levels (standard load): - Roof bracket tile adjustable US2-DBAV s_k = 2.2 kN/m² - Roof bracket tile heavy duty US2-DBCV s_k = 2.8 kN/m² - Roof bracket plain tile US2-DBC-plain tile s_k = 2.2 kN/m² - Roof bracket slate US2-DBC-slate s_k = 2.2 kN/m²
Conclusion	In this example, the on-roof mounting can be performed with the roof bracket tile heavy duty and 2 profile levels.	The characteristic snow load s_k is higher than the permissible load of the on-roof mounting. On-roof mounting cannot be performed in this form.	In this example, the on-roof mounting can be performed with the roof bracket tile heavy duty and 3 profile levels.	In this example, the on-roof mounting can be performed with the roof bracket tile adjustable, the roof bracket tile heavy duty and the roof bracket plain tile and 2 profile levels.

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 $q_{b,0}$ [1]	Backpressure	Peak speed (gust speed) v_p [2]		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/m²	kN/m²	m/s	km/h	Number of additional weights with 50 kg each [3]						
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	1.0	40.8	147	Detailed determination necessary by structural engineer						

[1] Base speed pressure $q_{b,0}$ according to EN 1991-1-3 and -4
[2] Peak speed (gust speed) v_p according to ÖNORM B 1991-1-4
[3] 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

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/m²
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.dlubal.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
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

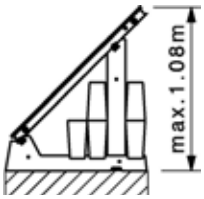
Gust speed in wind zone 4:

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

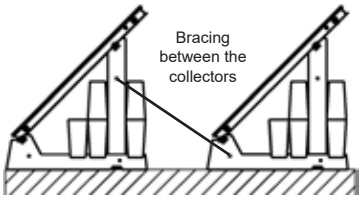
With the value of the maximum gust speed, the number of required additional weights (50 kg each) per concrete base can be calculated. The value in the tables must be above the maximum gust speed of the location.

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.

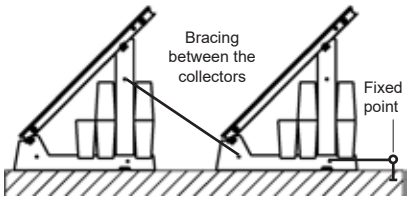


Safety level 1
- Increase in dead weight with number of additional weights

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 field



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/m² 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 m²

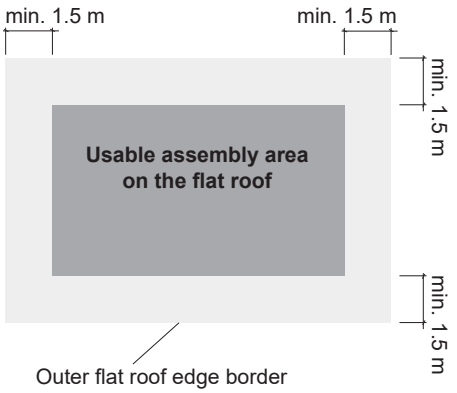
The following number of concrete bases are included in the calculation per row: Number of collectors +1

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.

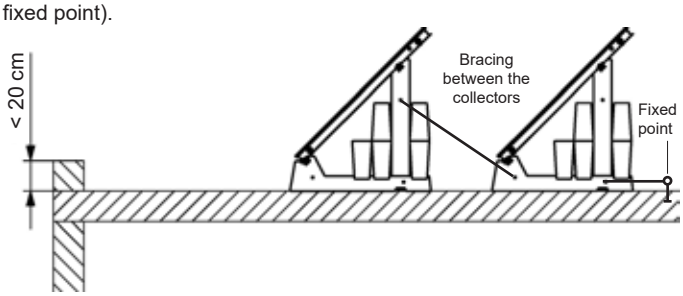
Table 4

	Number of collectors/row Weight per collector in a row in kg							
	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

Flow rate		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

Looking for the appropriate hydraulic schematic?
Please contact your local Hoval partner.