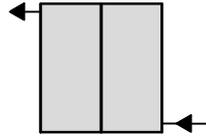
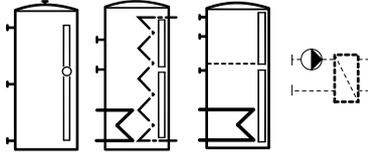


Solar collectors

**Hoval UltraSol® 2**

■ Description	3
■ Part numbers	4
■ Dimensions	25
■ Space requirements	28
■ Engineering	32

**Buffer storage tanks,
stratified storage tanks
and stratified
combination storage
tanks**

**Hoval EnerVal, EnerVal G, EnerVal G cool
Hoval VarioVal FLS
Hoval VarioVal RLS, RHS**

 see rubric
«Calorifiers»

Calorifiers

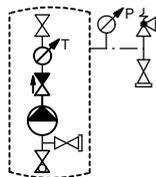
**Suitable calorifiers**
 see rubric
«Calorifiers»

■ Enamelled version	
CombiVal ER, ESR, ESSR	200-1000 l
MultiVal ERR, ESRR	300-1000 l
■ Stainless steel version	
CombiVal CR, CSR	200-2000 l
MultiVal CRR, CSRR	500-2000 l

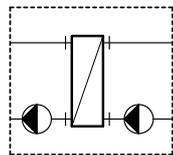
Solar armature groups

Product overview and utilisation

45

**Hoval solar armature groups**

■ Description	47
■ Part numbers	48
■ Technical data	55
■ Dimensions	58
■ Engineering	61

**Hoval Solar heat transfer stations**

■ Description	63
■ Part numbers	64
■ Technical data	66
■ Dimensions	70

TopTronic® E controller**Hoval TopTronic® E solar module**

- Description 73
- Part numbers 78
- Technical data 82
- Dimensions solar controller set 83
- Examples 84
 - Heat quantity balancing 84

Engineering

- General information 85
- Components of the solar plant 86
- Collector data 87
- Dimensioning guidelines 88
- Dimensioning recommendations for the components 90

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

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



Certifications

*Hoval
UltraSol® 2*

*Solar Keymark
011-7S2954 F*

Model range

UltraSol® 2 type	Installation	Gross collector surface area m ²	Absorber surface area/ Aperture surface m ²
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® 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		Number of collectors units
	Gross m ²	Absorber m ²	
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 m ²	Absorber m ²	
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

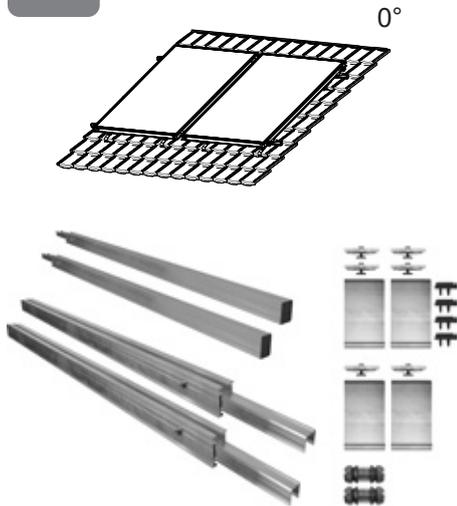
Installation set

See following pages

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



On-roof installation



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

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

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 5.6¹⁾ kN/m²

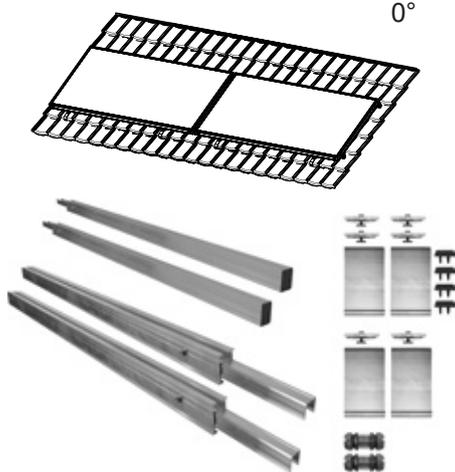
Consisting of:

- 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°



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

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

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



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 5.6¹⁾ kN/m²

Consisting of:

- Support sections (collector supports)
- US2 collector clamps cpl.

for number of collectors horizontal per collector field units Installation set

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

Part No.

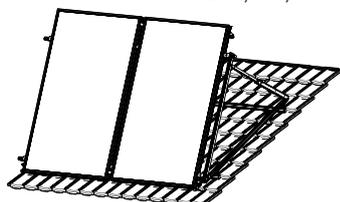
Installation sets for on-roof installation

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	
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 5.6¹⁾ kN/m²

Consisting of:

- Support sections (collector supports)
- US2 collector clamps cpl.
- Cross-connector for support profiles

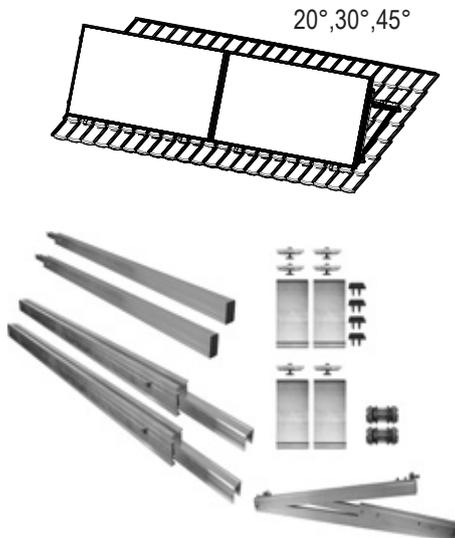
for number of collectors vertical per collector field units	Installation set	
1	AD20-45V-1	6052 947
2	AD20-45V-2	6052 948
3	AD20-45V-3	6052 949
4	AD20-45V-4	6052 950
5	AD20-45V-5	6052 951
6	AD20-45V-6	6052 952
7	AD20-45V-7	6052 953
8	AD20-45V-8	6052 954

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

Part No.

Installation sets for on-roof installation

side-by-side, horizontal 20°,30°,45°



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

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

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



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 5.6¹⁾ 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

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

6052 955
6052 956
6052 957
6052 958
6052 959
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



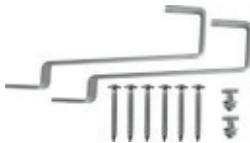
Packing plate 2 mm
for levelling the roof bars

2061 367



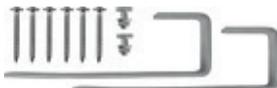
Packing plate 3 mm
for levelling the roof bars

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



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

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 M10 x 150
- 2 quick-mount adapters M10 cpl.

Part No.

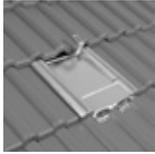
6037 770

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



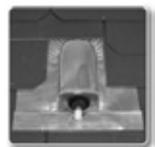
Roof bushing, type clay 260
for tube bushing (1 tube) through
the roof cladding (e.g. variable-
gauge tiles and plain tile)
galvanised version, 2 pieces

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

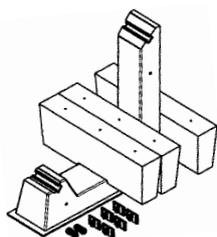
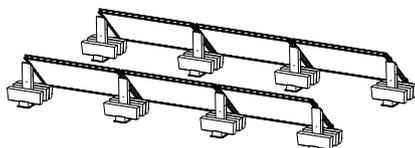
Installation sets

Flat roof installation concrete base

side-by-side, horizontal

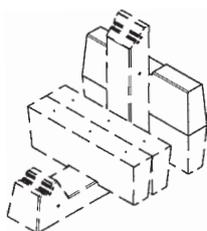


Flat roof-mounting
Concrete base



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.



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

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

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

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
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

Dimension solar line
stainless steel corrugated tube

DN 15	6051 315
DN 20	6051 316
DN 25	6051 317



Hydraulics basic set GS 18-3/4" ET FS90
for hydraulic connection of a collector field to connection fitting 3/4" external thread flat sealing.
Consisting of:
- 2 connection brackets 90°, 18-3/4" external thread flat sealing
- 1 vent plug
- 1 dummy plug
- 2 flat seals
Collector connections:
- Ø 18 mm Cu round pipe

6051 314



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

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).

Dimension solar line stainless steel corrugated tube	Connection fitting	
DN 15	R 3/4"	6026 411
DN 20	R 3/4"	6026 412
DN 25	R 3/4"	6026 413



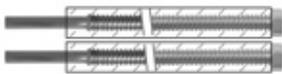
Solar branch kit FL/RT
for connecting several collector fields to a shared Hoval solar line. Metallically sealing. 3 connections. Consisting of:
- 2 T-pieces

Dimension solar line stainless steel corrugated tube	
DN 15	6042 233
DN 20	6042 234
DN 25	6042 235



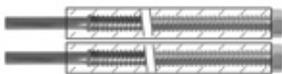
Connection coupling
for extending the solar cable

Dimension solar line stainless steel corrugated tube	Typ	
DN 15	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, 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"

Part No.

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 18-3/4" ET FS
for hydraulic connection of a
collector field to connection fitting
3/4" external thread flat sealing.
Consisting of:
- 2 straight connection fitting,
18-3/4" external thread flat sealing
- 2 flat seal
Collector connections:
- Cu round pipe Ø 18 mm

6051 320



Connection set AS-US2 18-3/4" ET FS90
for hydraulic connection of a
collector field to connection fitting
3/4" external thread flat sealing.
Consisting of:
- 2 connection brackets 90°,
18-3/4" 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
20	2-12	¾" x ¾"	2.2
20	8-30	¾" x ¾"	5.0
25	10-40	1" x 1"	8.1
32	20-70	1¼" x 1¼"	17.0

Part No.

- 2038 034
- 2038 035
- 2038 036
- 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



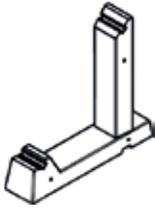
Hanger bolt M12 x 300 CR
incl. EPDM seal,
nut and locknut

2053 051

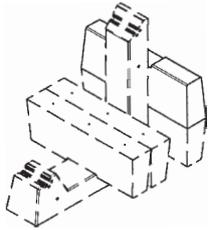
		Part No.
	Carrier profile ADKBV cpl. 1360 mm On-roof short base - vertical	6050 655
	Carrier profile ADLBV cpl. 1986 mm On-roof base long - vertical	6050 656
	Carrier profile ADKEV cpl. 1252 mm On-roof expansion short - vertical incl. profile connector 45 cpl.	6050 657
	Carrier profile ADLEV cpl. 1878 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.
	<p>Cross-connector cpl. for attaching the elevation with the carrier profiles</p>	6037 788
	<p>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</p>	6050 662
	<p>Mounting set 5-US2 ADES Collector fastening extension set On-roof mounting Consisting of: - 2 US2 collector middle clamps cpl. - 2 anti-slip protections</p>	6050 663
	<p>Collector clamp 5-US2 AD Individual collector clamp for on-roof installation Consisting of: - 1 US2 collector clamp cpl.</p>	6050 677
	<p>Mounting set 5-US2 BSGS Collector fastening basic set Flat roof mounting concrete base Consisting of: - 4 US2 collector end clamps cpl.</p>	6050 664
	<p>Mounting set 5-US2 BSES Collector fastening extension set Flat roof mounting concrete base Consisting of: - 2 US2 collector middle clamps cpl.</p>	6050 665

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
 Dimensions (L x W x H):
 930 x 190 x 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
 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

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

Part No.

6050 805

2075 124

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.

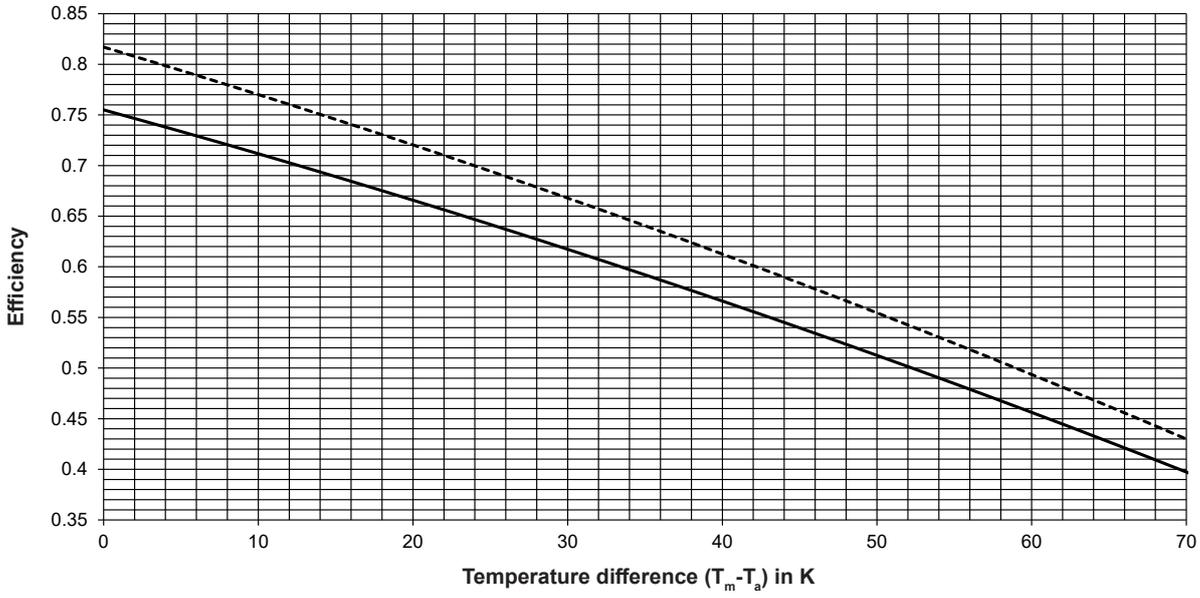
UltraSol® 2

Type	UltraSol® 2		
		V	H
Optical efficiency (aperture surface) $\eta_{0,b}^{1)}$	%	81.7	81.7
$a_1^{1)}$	W/(m ² K)	4.55	4.55
$a_2^{1)}$	W/(m ² K ²)	0.014	0.014
Optical efficiency (gross area) $\eta_{0,b}^{2)}$	%	75.5	75.5
$a_1^{2)}$	W/(m ² K)	4.2	4.2
$a_2^{2)}$	W/(m ² K ²)	0.013	0.013
Reference surfaces			
• Total surface area	m ²	2.53	2.53
• Aperture surface	m ²	2.33	2.33
• Absorber surface	m ²	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/(m ² K)	0.039	0.039
• Thickness	mm	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 m ²)	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

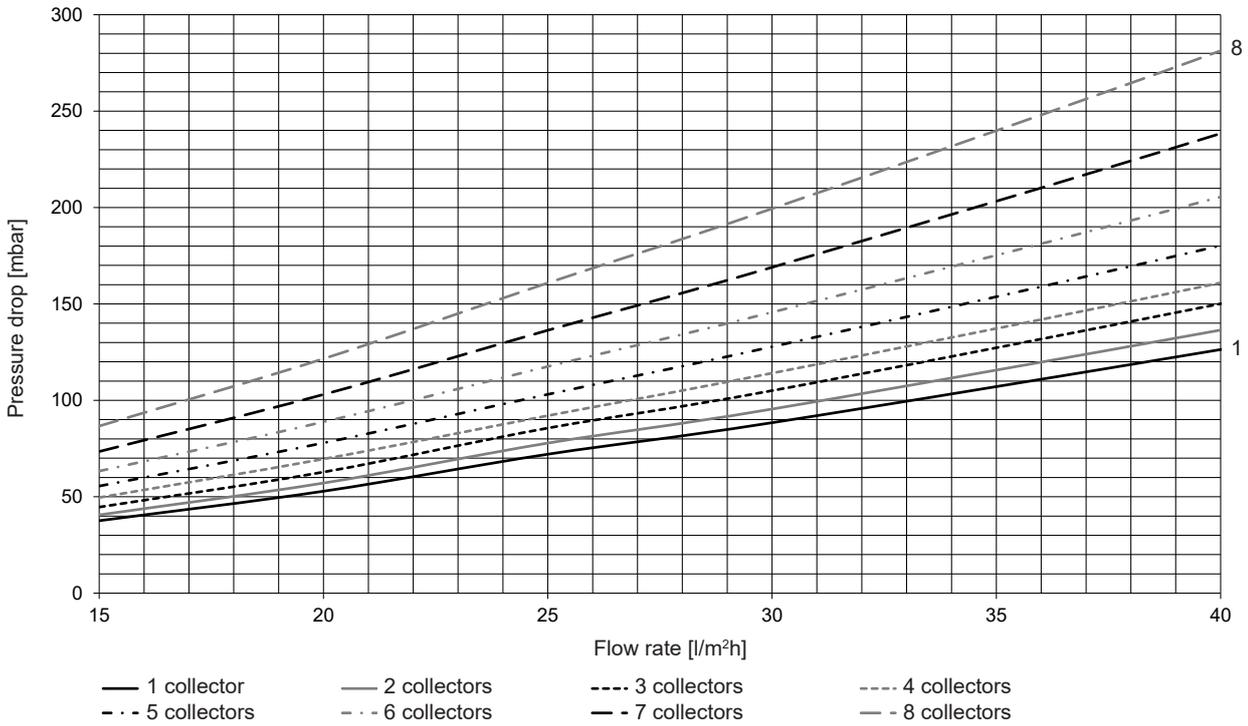


— UltraSol® 2 (Gross area)
 - - - - UltraSol® 2 (Aperture surface)

T_m = average collector temperature
 T_a = ambient temperature

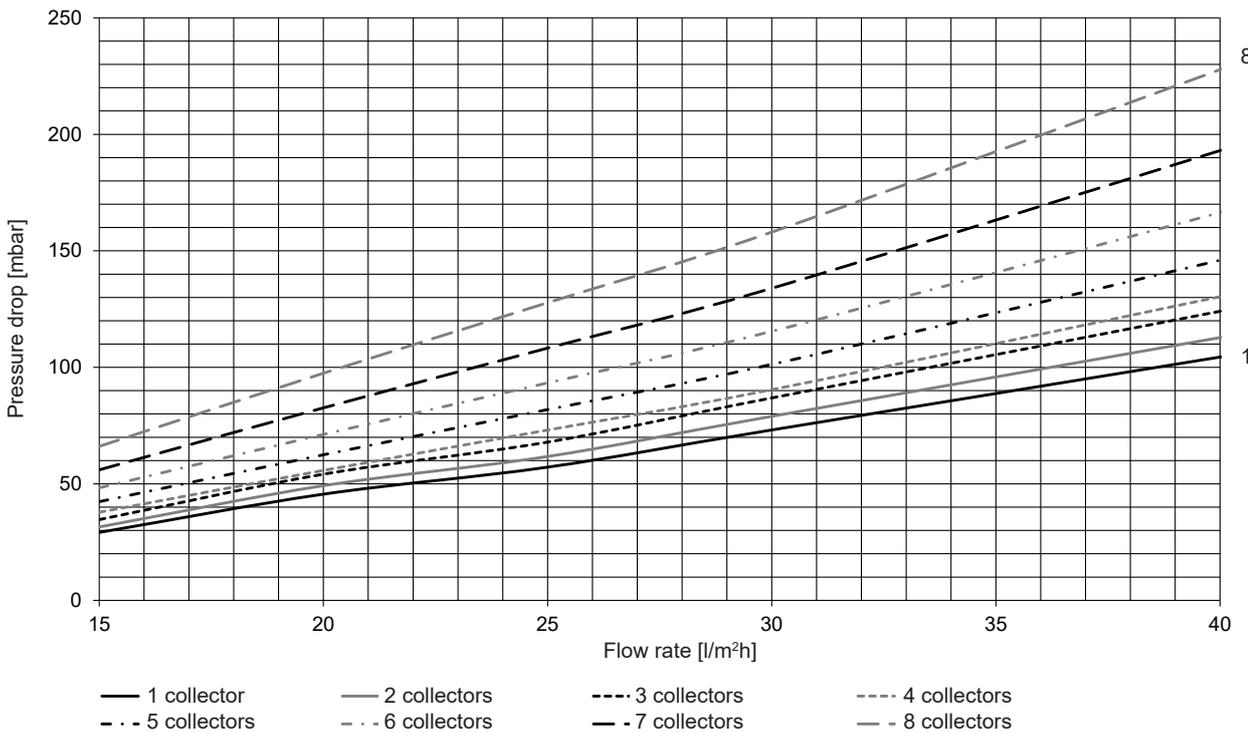
Pressure drop - UltraSol® 2, vertical

Water-Glycol mixture - temp. 20 °C



Pressure drop - UltraSol® 2, horizontal

Water-Glycol mixture - temp. 20 °C

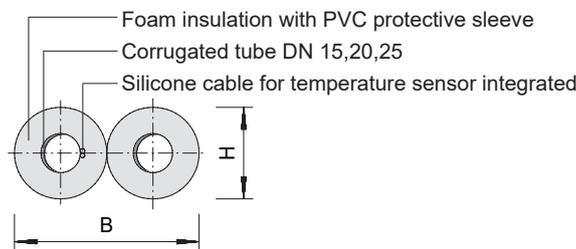


Solar cable SL

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

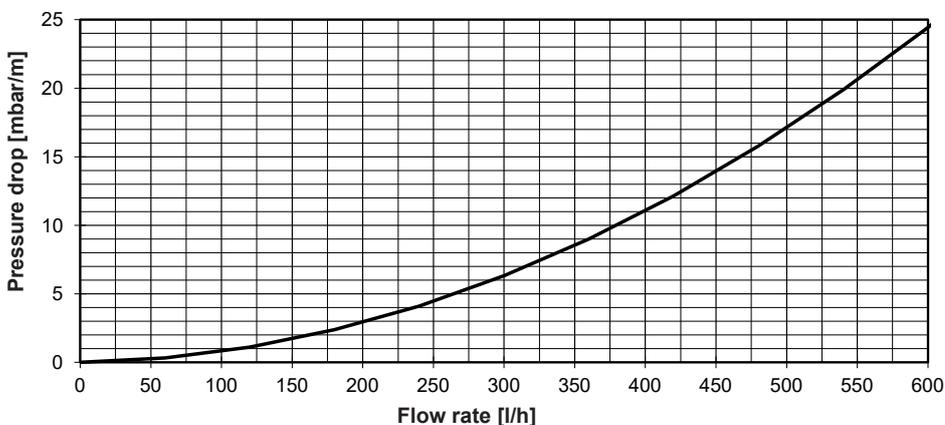
Type	Nominal pipe width		Di mm	De mm	Radius mm	Max. operating pressure bar	Weight kg/m	Wall thickness mm	Content l/m
	DN	R							
SL 15	15	R 1/2"	16.6	21.4	35	10	0.140	0.18	0.28
SL 20	20	R 3/4"	20.6	26.2	40	10	0.195	0.18	0.43
SL 25	25	R 1"	25.6	31.6	50	10	0.235	0.20	0.64

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

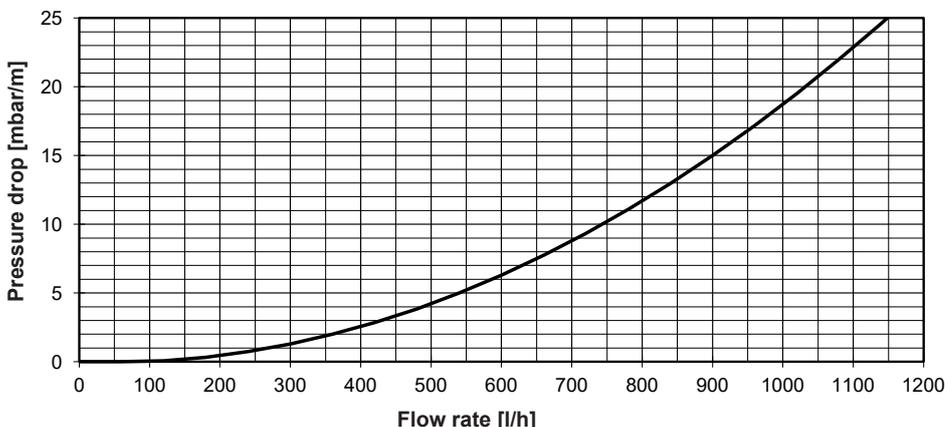


Specific pressure drop value (per metre individual pipe)
 Glycol/water mixture 40/60 % and 40 °C

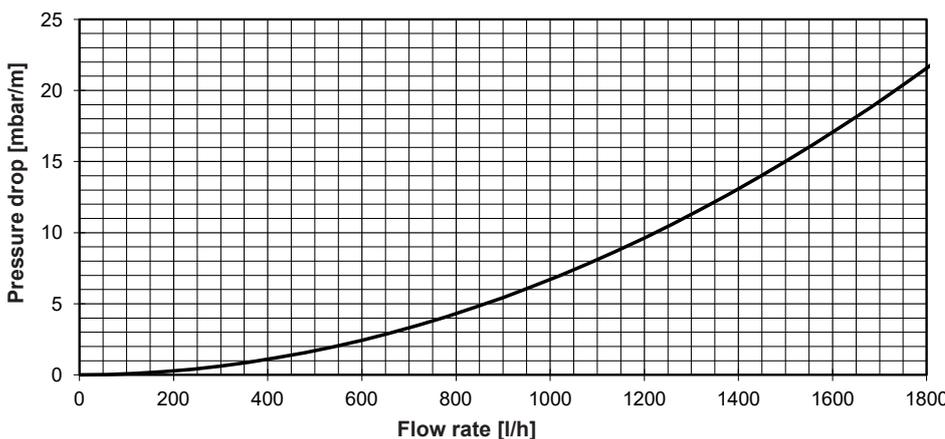
DN 15



DN 20

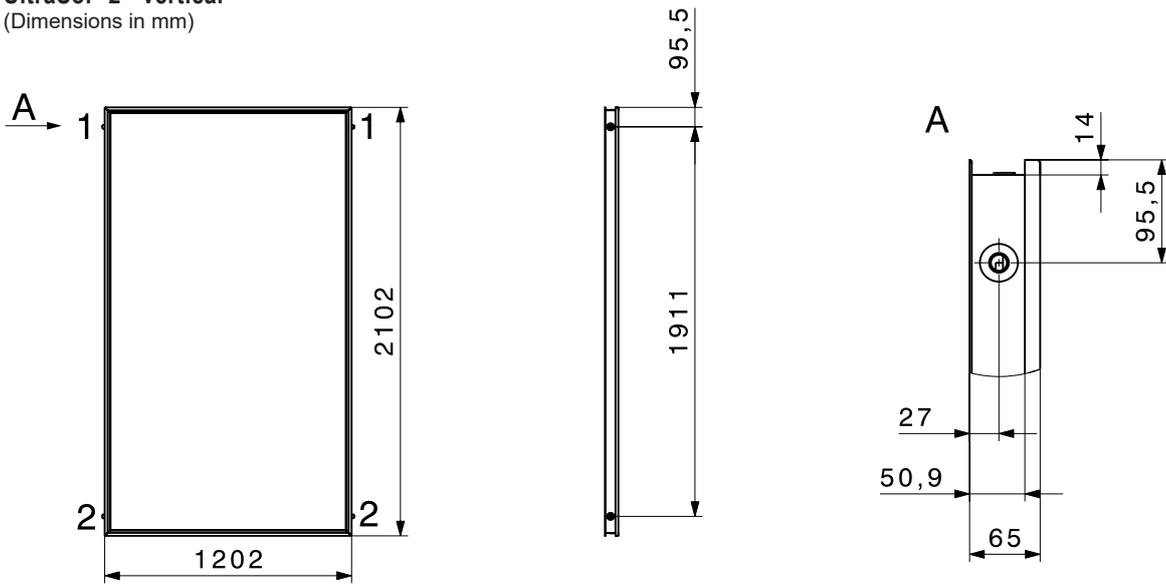


DN 25



1 mbar = 100 Pa = 0.1 kPa

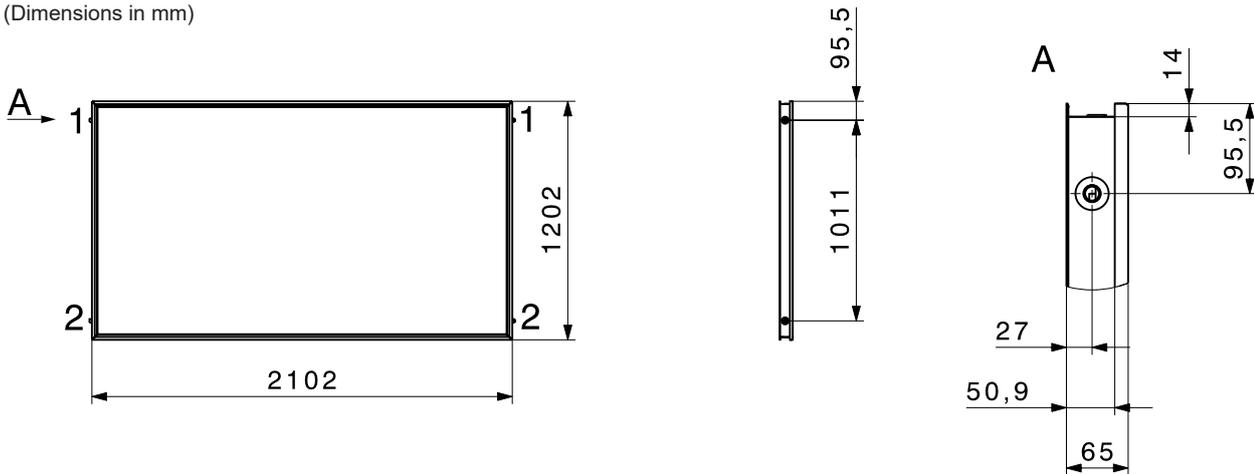
UltraSol® 2 - vertical
(Dimensions in mm)



- 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)

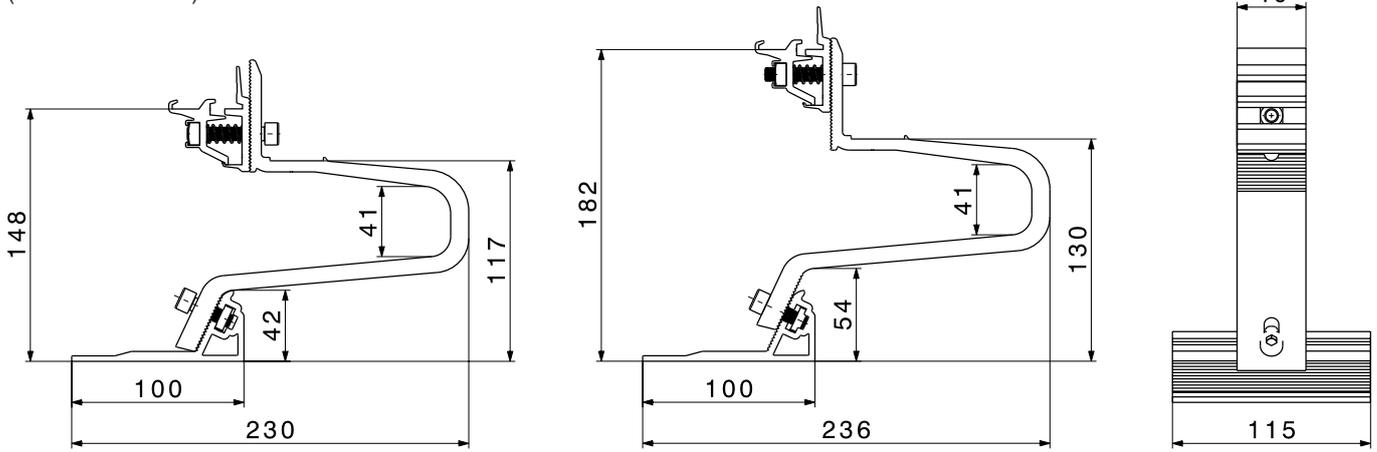
UltraSol® 2 - horizontal
(Dimensions in mm)



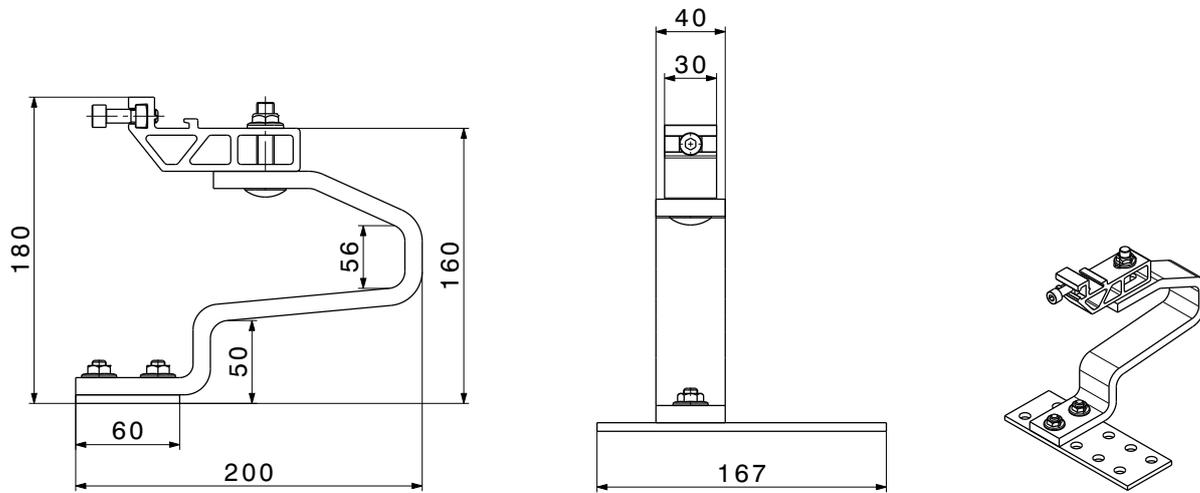
- 1 Outlet/collector flow hot; connection Ø 18 mm Cu round pipe
 - 2 Inlet/collector return; connection Ø 18 mm CU round pipe
- Sensor: position, see Engineering

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

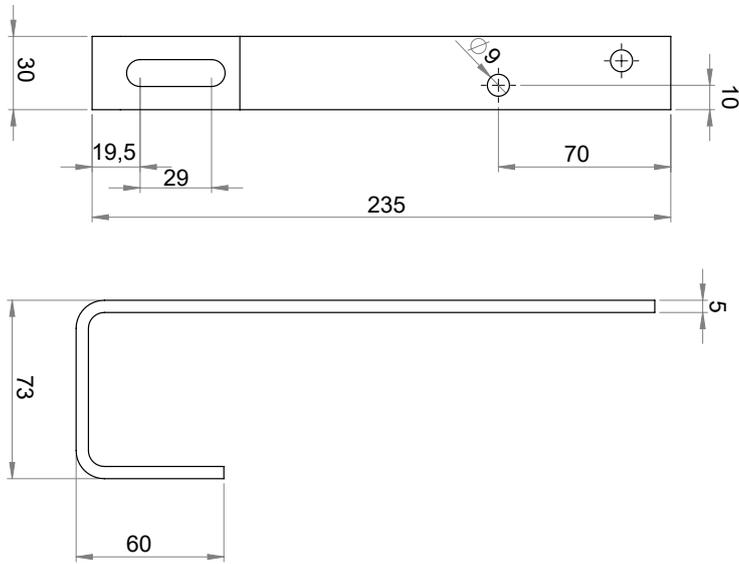
Roof bar tile adjustable - for on-roof installation
(Dimensions in mm)



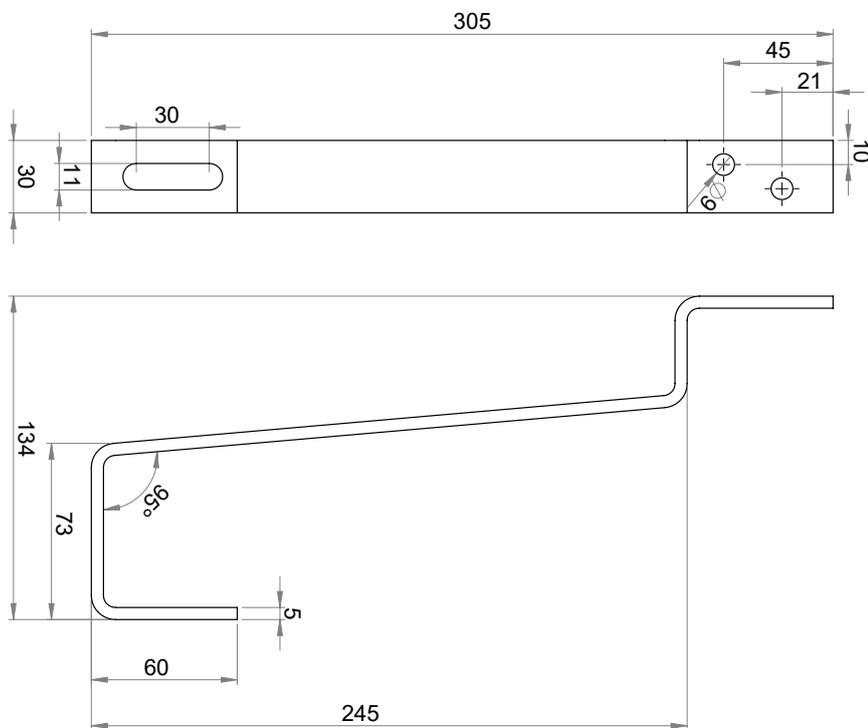
Roof bar tile heavy duty - for on-roof installation
(Dimensions in mm)



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

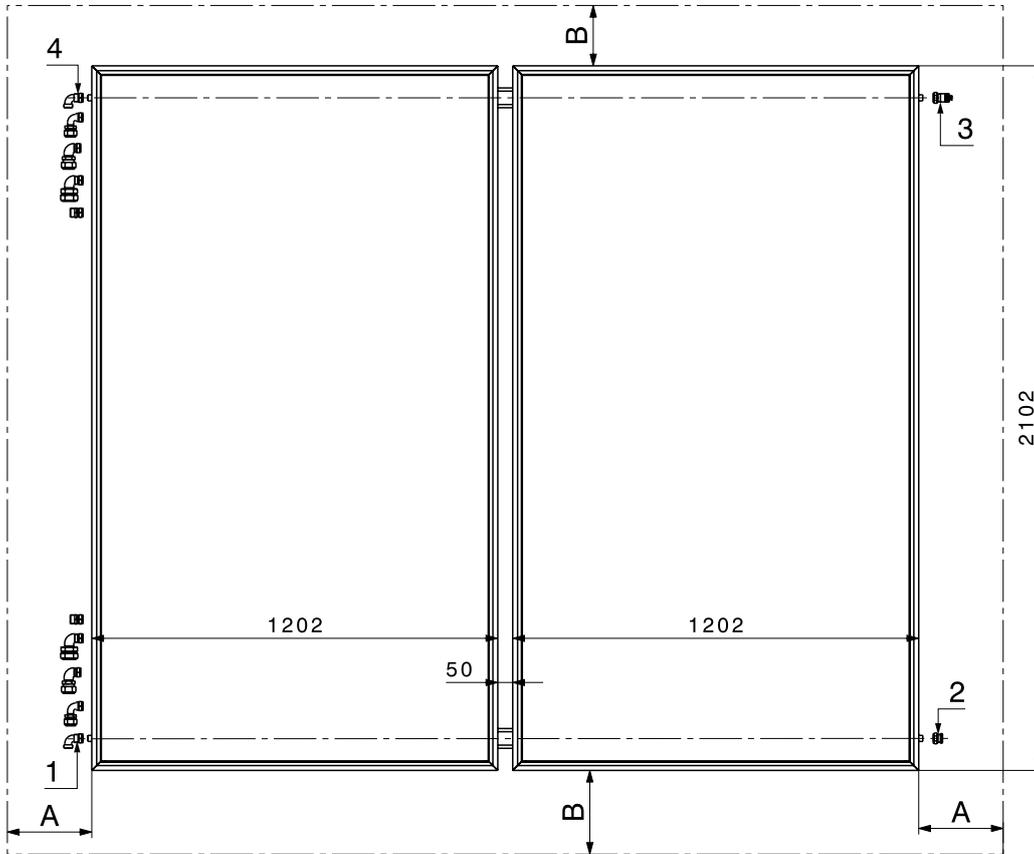


Roof bar plain tile - for on-roof installation
(Dimensions in mm)



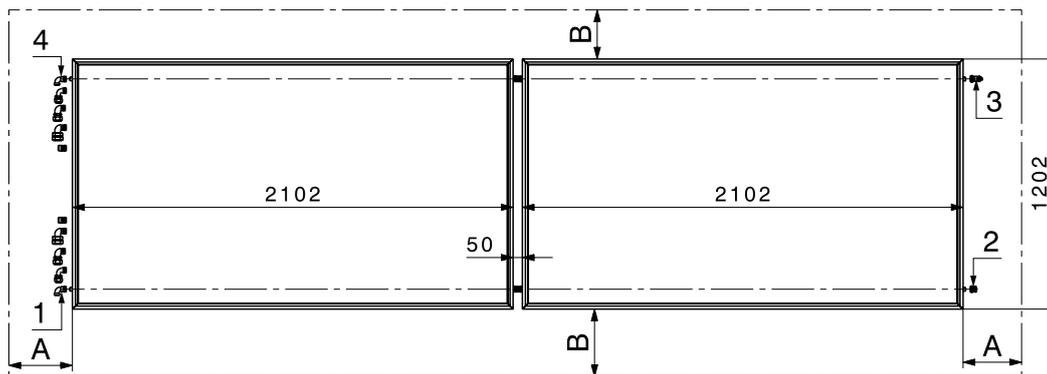
Space requirements

UltraSol® 2 - vertical
(Dimensions in mm)



Inverted configuration of the connections is also possible.

UltraSol® 2 - horizontal
(Dimensions in mm)



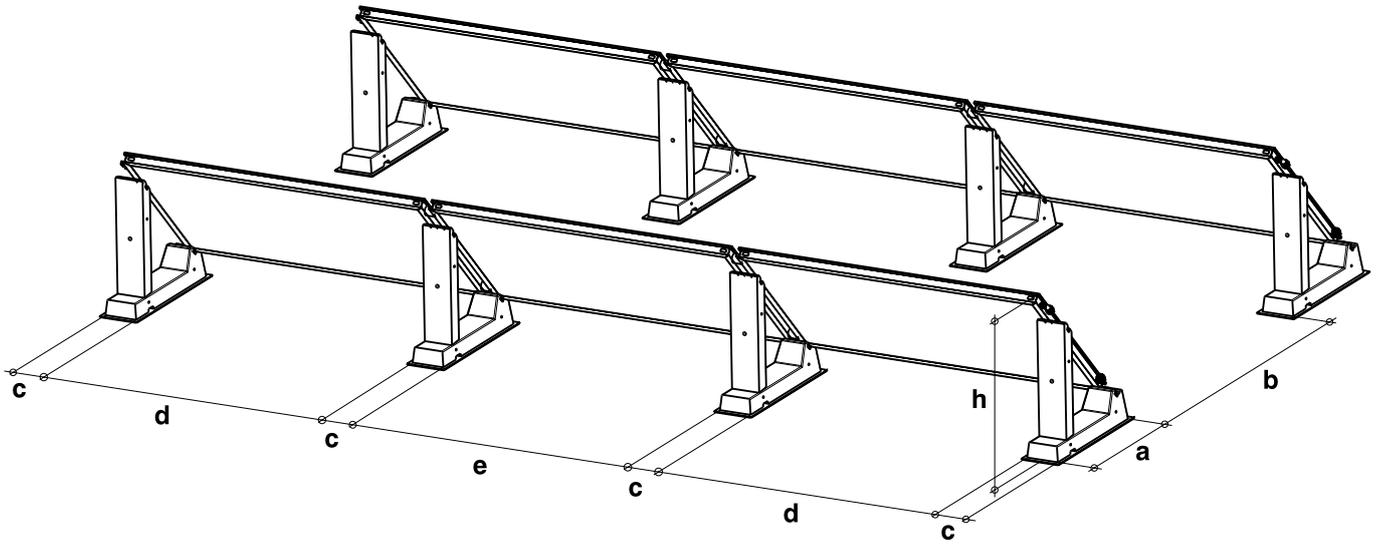
Inverted configuration of the connections is also possible.

- 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

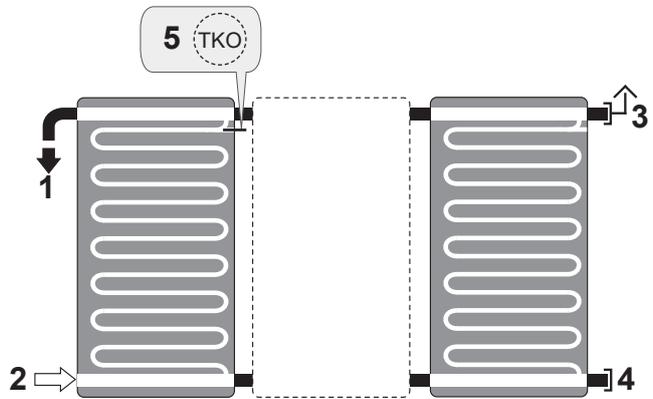
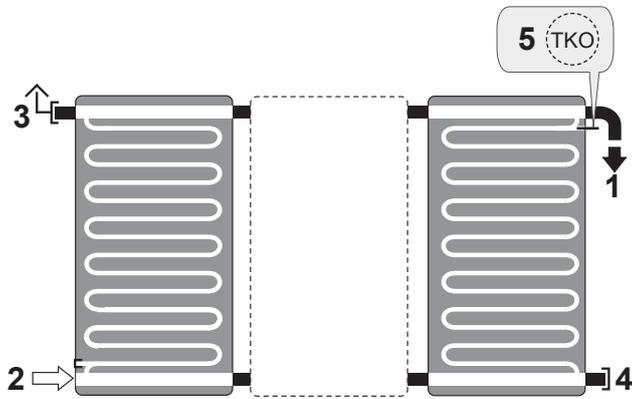
Piping of the collector series

Connection example for collector series

UltraSol® 2 V (collector vertical)

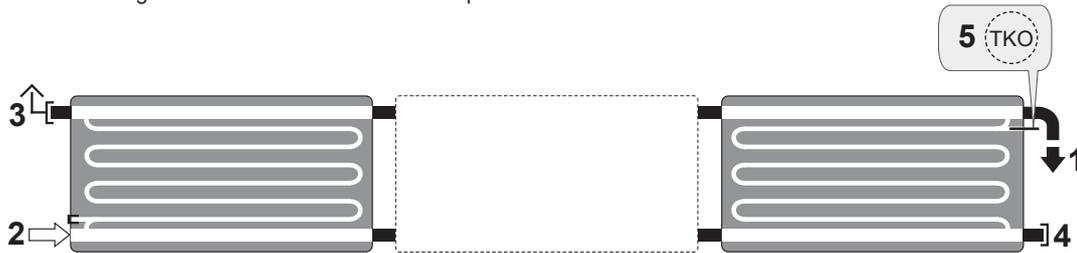
Connection variant: Tichelmann, max. 8 collectors/row
Inverted configuration of the connections is also possible.

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.

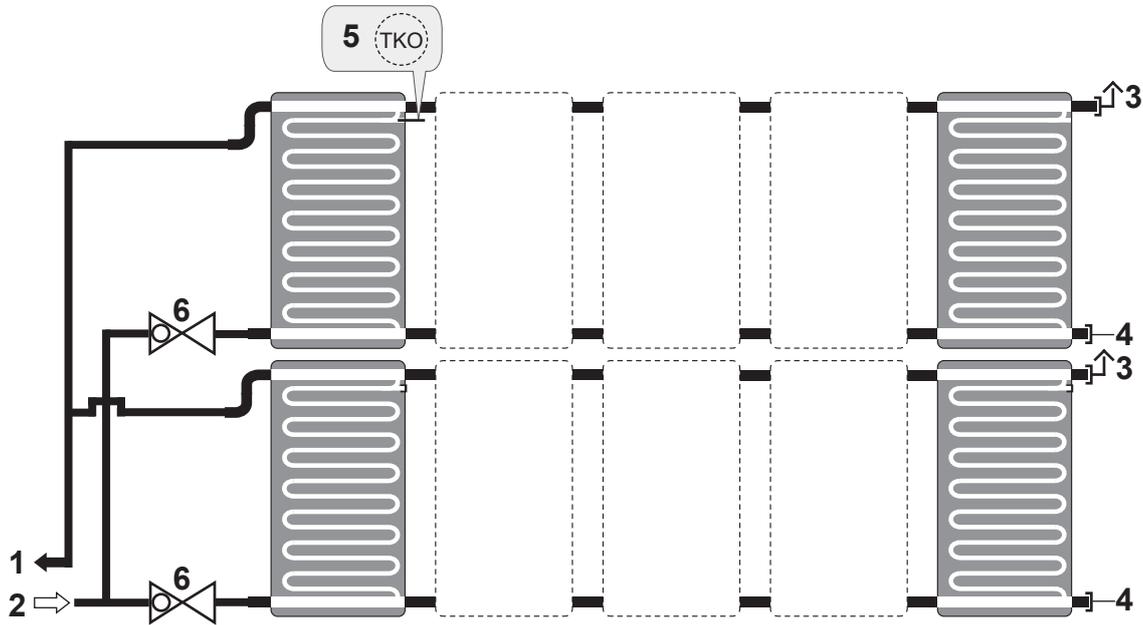


- 1 ← Line from collector field (collector flow, warm)
select short line routing
- 2 ← Line to collector field (collector return)
- 3 ↗ Dummy plug with integrated manual vent

- 4 ■ Dummy plug
- 5 (TKO) Immersion sleeve
Differential control sensor or solar sensor

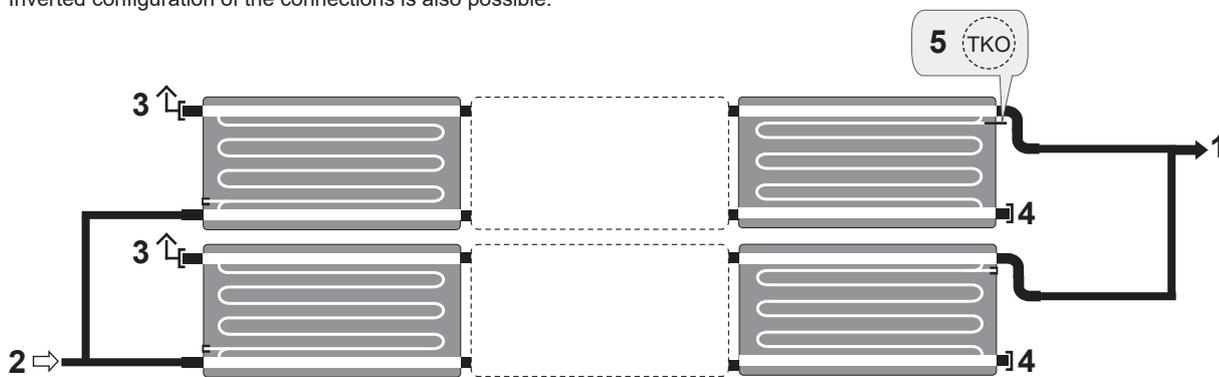
UltraSol® 2 V (collector vertical)

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 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 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 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

Rafter spacing max. permissible loads	[mm] [kN/m ²]	2 profile rows standard load					
		≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
		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-DBC	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 tiles³⁾ 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

Rafter spacing max. permissible loads	[mm] [kN/m ²]	3 profile rows increased load (statics supplement - extra 3rd support section)					
		≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
		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-DBC	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

Rafter spacing max. permissible loads	[mm] [kN/m ²]	2 profile rows standard load					
		≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
		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-DBC	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

Rafter spacing max. permissible loads	[mm] [kN/m ²]	3 profile rows increased load (statics supplement - extra 3rd support section)					
		≤ 600		> 600 ... ≤ 800		> 800 ... ≤ 1000	
		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: $s_k = 2.46 \text{ kN/m}^2$	CH-7000 Chur: $s_k = 2.46 \text{ kN/m}^2$	AT-6353 Going am Wilden Kaiser: $s_k = 4.08 \text{ kN/m}^2$	DE-83022 Rosenheim: $s_k = 1.39 \text{ kN/m}^2$
Permissible roof brackets (see Table 1)	With 2 profile levels (standard load): - Roof bracket tile heavy duty US2-DBCV $s_k = 2.6 \text{ kN/m}^2$	Not a permissible design	With 3 profile levels (increased load): - Roof bracket tile heavy duty US2-DBCV $s_k = 4.1 \text{ kN/m}^2$	With 2 profile levels (standard load): - Roof bracket tile adjustable US2-DBAV $s_k = 2.2 \text{ kN/m}^2$ - Roof bracket tile heavy duty US2-DBCV $s_k = 2.8 \text{ kN/m}^2$ - Roof bracket plain tile US2-DBC-plain tile $s_k = 2.2 \text{ kN/m}^2$ - Roof bracket slate US2-DBC-slate $s_k = 2.2 \text{ kN/m}^2$
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⁾	Back-pressure	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/m ²	kN/m ²	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/m ²
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
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:

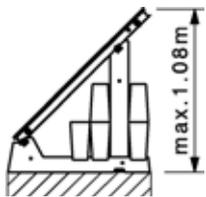
Reference height in metres	GK I in km/h	GK II in km/h	GK III in km/h	GK IV in km/h
0	149	140	133	124
10	174	157	137	124
16	182	166	148	125
20	186	170	153	130

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.

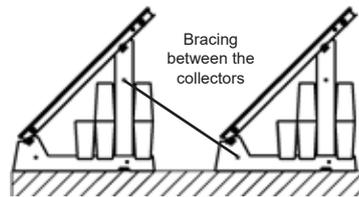
Safety levels for fastening and installation conditions

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.



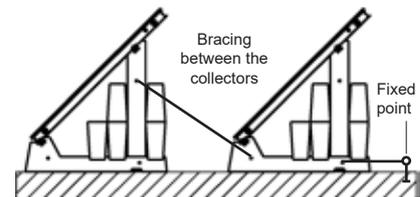
Safety level 1

- Increase in dead weight with number of additional weights



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)

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

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.

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 relates to

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

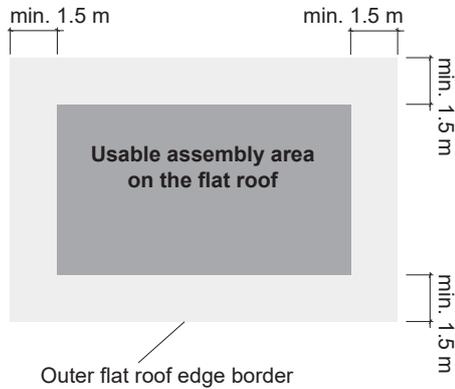
Table 4 Number of collectors/row
Weight per collector in a row in kg

	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

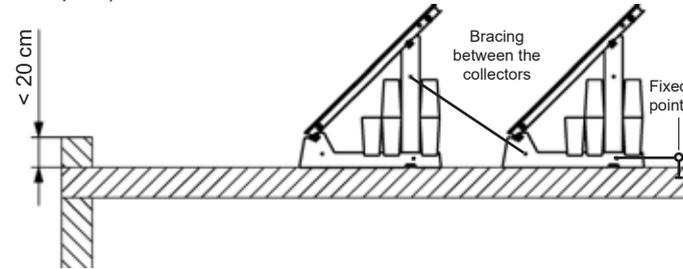
To prevent impermissible wind suction loads, the collectors must not be installed near the edges of the roof. The relevant standards must be observed in this case.

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.**

Solar armature groups without heat exchanger (direct)

SAG20



SAG25/32



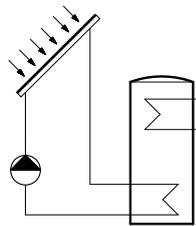
SAG20 und SAR20



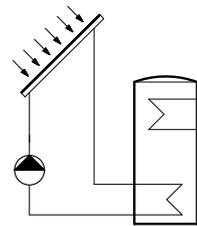
Collector surface approx. m ²	25	40/100	40
--	----	--------	----

Examples

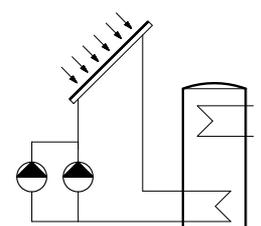
Solar system for hot water



Solar system with SAG20



Solar system with SAG25/32



Solar system with SAG20 and SAR20 combined for parallel pump operation

Solar armature groups with heat exchanger

TransTherm® solar

(25)



(50)



(100)



(200)



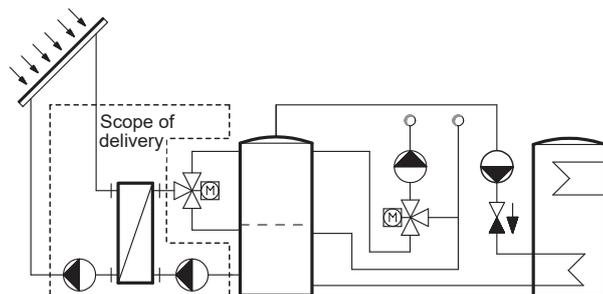
Collector surface approx. m ²	25	50	100	150
--	----	----	-----	-----

Heat exchanger	built in	•	•	•	•
----------------	----------	---	---	---	---

Reversing valve	external (option)	•	•	•	•
-----------------	-------------------	---	---	---	---

Example

Solar system for heating and hot water, storage stratified charge top or centre with reversing valve



Hoval solar armature group SAG20

- Solar armature group DN 20 (¾")
- Circulating pump included separately
- 2 ball valves (key-operated) with thermometer
- Backflow preventer in the flow and return
- Adjustable flow rate with display (1-20 l/min.) or FlowRotor (0.5-15 l/min.) with PT1000 sensors (only for type FR)
- Permanent air vent AirStop
- Safety device
 - Safety valve (6 bar)
 - Pressure gauge (6 bar)
 - Flexible connection hose made of stainless steel for the diaphragm pressure expansion tank
- Rinsing and filling unit
- Shapely designed heat damming box made of EPP half shells

Delivery

- Solar armature group packed
- Pump delivered separately packed



Solar armature/ group/pump type	Continuous flow measurement range		Speed control			
	Calibration valve l/min	FlowRotor l/min				
SAG20/SPS 7	1-20	-	•	•		•
SAG20/SPS 7 PM2 ¹⁾	1-20	-			•	
SAG20FR/SPS 7 PM2 ¹⁾	-	0.5-15			•	

¹⁾ Actuation of pump only possible with PWM-capable controller (TopTronic® E)

Hoval solar armature group SAG25/SAG32

- Solar armature group DN 25 (1")/DN 32 (1¼")
- Circulating pump separately packed
- 2 ball valves (key-operated) with thermometer
- Backflow preventer in the flow and return
- Safety device (6 bar)
 - Safety valve (6 bar)
 - Pressure gauge
 - Flexible connection hose made of stainless steel for the diaphragm pressure expansion tank
- Rinsing and filling unit
- Wall mounting console enclosed separately
- Shapely designed heat damming box made of EPP half shells

Delivery

- Solar armature packed
- Pump delivered separately packed
- Optional calibration valves and air vent available (recommended)



Solar armature group/pump type	Continuous flow measurement range		Speed control				
	Calibration valve l/min	FlowRotor l/min					
SAG25/SPS 8	10-40 ¹⁾	1-35 ¹⁾	•	•	•	•	•
SAG32/SPS 12 PM2	20-70 ¹⁾	5-100 ¹⁾	•		•	•	

¹⁾ Optional accessory (recommended): calibration valve or FlowRotor

Hoval solar return armature group SAR20

- Solar return armature group DN 20 (¾")
- Circulating pump included separately
- Ball valve (key-operated) with thermometer
- Backflow preventer
- Adjustable flow rate with display (1-20 l/min.) or FlowRotor (0.5-15 l/min.) with PT1000 sensors (only for type FR)
- Safety device
 - Safety valve (6 bar)
 - Pressure gauge (6 bar)
 - Flexible connection hose made of stainless steel for the diaphragm pressure expansion tank
- Rinsing and filling unit
- Shapely designed heat damming box made of EPP half shells
- Incl. screw connection 1" internal thread for mounting at the calorifier

Delivery

- Solar armature group packed
- Pump delivered separately packed



Solar return armature group/pump type	Continuous flow measurement range		Speed control			
	Calibration valve l/min	FlowRotor l/min				
SAR20/SPS 7	1-20	-	•	•		•
SAR20FR/SPS 7 PM2 ¹⁾	-	0.5-15			•	

¹⁾ Actuation of pump only possible with PWM-capable controller (TopTronic® E)

FR = integrated flow rate sensor
PWM = variable flow rate possible

Speed control legend	
	Δp-v Variable differential pressure
	ENF Vent function 10 min.
	PWM control signal solar
	Δp-c Constant differential pressure
	n-const Constant speed

Solar armature groups



Hoval solar armature groups

SAG20/25/32

Solar armature group/pump

Continuous flow measurement range

type	Calibration valve l/min	Flow rotor l/min
SAG20/SPS 7	1-20	-
SAG20/SPS 7 PM2 ^{2), 3)}	1-20	-
SAG20FR/SPS 7 PM2 ^{2), 3)}	-	0.5-15
SAG25/SPS-I 8	10-40 ¹⁾	1-35 ¹⁾
SAG32/SPS 12 PM2 ²⁾	20-70 ¹⁾	5-100 ¹⁾

Part No.

6049 478
6049 479
6049 480
6059 332
6040 931



Hoval solar return armature groups

SAR20

Solar return armature group/pump

Continuous flow measurement range

type	Balancing valve l/min	Flow rotor l/min
SAR20/SPS 7	1-20	-
SAR20FR/SPS 7 PM2 ³⁾	-	0.5-15

6049 481
6049 482

¹ Optional accessory (recommended): calibration valve or FlowRotor

² with PWM interface

³ Actuation of pump only possible with PWM-capable controller (TopTronic® E)

FR = integrated flow rate sensor

Accessories



Solar controller set WM complete
 for wall mounting
 consisting of a black housing incl.
 TopTronic® E solar module
 1x immersion sensor TF/2P/5/6T, L = 5 m
 1x collector sensor TF/1.1P/2.5S/5.5T,
 L = 2.5 m
 Basic connector set
 Blind cover for control module cut-out
 incl. wall mounting material

TopTronic® E control module as an option

Part No.

6027 257



Solar controller set AG complete
 for mounting on regulating armature
 SAG20 or SAR20
 consisting of a black housing incl.
 TopTronic® E solar module
 1x immersion sensor TF/2P/5/6T, L = 5 m
 1x collector sensor TF/1.1P/2.5S/5.5T,
 L = 2.5 m
 Basic connector set
 Blind cover for control module cut-out

TopTronic® E control module as an option

6037 492



TopTronic® E control module black with 4.3" colour touchscreen
 For operation of all controller modules
 connected to the bus system
 (basic, solar, buffer modules etc.)
 Connection to the Hoval bus system
 via RJ45 plug connection or via
 plug terminals (max. 0.75 mm²),
 flat design with flexible
 installation option
 Installation:
 - in control panel of the heat generator
 - in the Hoval wall casing
 - in the control panel front,
 black high-gloss cover,
 customer-specific configurable
 start screen,
 Display of current weather or
 weather forecast (only possible in
 combination with HovalConnect)

Consisting of:
 - TopTronic® E control module black
 - Clamping device set control module
 - RJ45-RAST 5 CAN cable, L = 500

6043 844

Accessories



Calibration valve TN

As regulating and shut-off valve with direct display of the flow rate on the sight glass.
Max. operating temperature: 185 °C

DN	Measuring range [l/min]	Connection Rp x Rp	kvs m ³ /h
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



FlowRotor kit

for performance related control, system monitoring and heat metering.
Consisting of:

Proximity-type flow rate sensor and PT1000 sensors.

Pre-assembled ready for connection, sensor cable included.

Operating temperature: max. 120 °C

DN 20: can be installed in the insulation of an SAG/SAR20.

DN 25/32: can be installed under an SAG25/32

DN	Measuring range [l/min]	Connection inches
20	0.5-15	3/4"
25	1-35	1"
32	5-100	1 1/4"

6037 631
6037 632
6037 693



Permanent air vent 3/4"

brass, vertical installation in the flow of the solar line for permanent degassing of the solar liquid

Integrated collecting tank for gases

Manual venting using spanner

Connections: top R 3/4", bottom Rp 3/4"

641 311



Permanent aspirator 1" Airstop

Made of brass.

Installation in the flow of the solar circuit for the permanent degassing of the solar fluid.

Collecting box for the gases integrated

Deairing manual via screw wrench

Connections: above, lower R 1"

641 463



Permanent air vent

With high air separation efficiency due to stainless steel filter

Automatic degassing

Installation in horizontal lines of the collector return

Max. operating temperature 160 °C

Max. operating pressure PN 10

Type	kvs m ³ /h	Application limit l/min
3/4"	10.0	23
1"	28.1	35
1 1/4"	48.8	58

6014 392
6031 803
6031 804

Accessories



Clamping ring connector

for the connection of solar armature groups
 DN 20 (¾"), self-sealing with O-ring, metallic
 clamping ring and stilt sleeve.
 Applicable up to 150 °C.
 Connection ¾" external thread x 15 mm
 Connection ¾" external thread x 18 mm
 Connection ¾" external thread x 22 mm

Part No.

6010 055
 6010 056
 6010 057



Straight-way ball valve VAG60..
DN 15-25, PN 16, 120 °C

- Brass straight-way ball valve with threaded connection
- incl. seals and screw connections

DN	Connection valve inches	fitting inches	kvs m³/h	Ḃat ΔP 50 mbar m³/h
15	G 1"	Rp ½"	9	2.01
20	G 1¼"	Rp ¾"	17	3.80
25	G 1½"	Rp 1"	22	4.92

6046 579
 6046 580
 6046 581



Switching ball valve VBI60...L
DN 15-32, PN 40, -10...120 °C

- Ball valve body made of brass
- Connections with internal thread Rp acc. to ISO 7-1
- Leakage rate: 0 ... 0.0001 % of Kvs value

DN	Connection inches	kvs m³/h
15	Rp ½"	5
20	Rp ¾"	9
25	Rp 1"	9
32	Rp 1¼"	13

6052 422
 6052 443
 6052 444
 6052 445



Motor drive GLB341.9E

For straight-way ball valves VAG60.. and switching ball valves VBI60.. DN 15..50
 Operating voltage: 230 V, 50/60 Hz
 Control signal 2-point/3-point
 Single-wire/2 wire control
 Operating time: 150 s
 Nominal torque: 10 Nm
 Permitted ambient temperature: -32 °C to +55 °C

2070 331

Accessories



Thermostatic water mixer TM200
 3-way-mixing valve for regulating of the water temperature
 Material: brass
 Connection dimension R 3/4"
 Hot water temperature max. 90 °C
 Adjustment range 30-60 °C
 Flow rate 27 l/min (at Δ p = 1 bar)
 Flow coefficient value (kvs) 1.62 m³/h



Thermostatic mixing valve JRG
 3-way mixing valve, made of brass, for regulating of the water temperature.
 Hot water max. 90 °C
 Adjusting range 45-65 °C
 Factory setting for: 55 °C
 Pressure: PN 10
 Connections: external thread (JRG 25-50)
 Flanges (JRG 65)
 incl. screwed joint

Type	Dimension	Connection size	kvs m³/h
JRG 25	1"	1 1/2"	4.0
JRG 32	1 1/4"	2"	8.5
JRG 40	1 1/2"	2 1/4"	12.0
JRG 50	2"	2 3/4"	16.0
JRG 65	DN 65	DN 65	28.0



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



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

Part No.

2005 915

2061 407

2061 408

2061 409

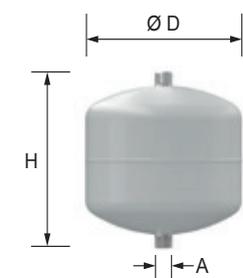
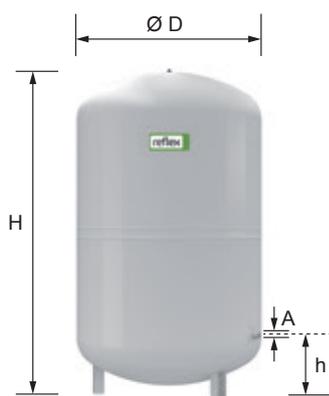
2061 410

2038 638

2077 235

2009 987

Diaphragm pressure expansion tanks



Reflex S

Especially for solar installations and also for heating and cooling water systems. For frost protection additive up to 50 %. Permitted operating pressure 10 bar. Permitted operating temperature of vessel/diaphragm 120 °C/70 °C. Type S 8-25 for wall installation with clamping band (clamping band see accessories) Type S 8-33 for wall installation with lugs. Type S 50-600 with feet. Gas inlet pressure at the factory: type S 8-33 1.5 bar and type S 50-600 3 bar

Reflex type	Ø D mm	H mm	h mm	A inches	Weight kg
S 8	206	332	-	G 3/4"	1.8
S 12	280	300	-	G 3/4"	2.2
S 18	280	409	-	G 3/4"	3
S 25	280	518	-	G 3/4"	3.7
S 33	354	455	-	G 3/4"	4.8
S 50	415	469	158	R 3/4"	8
S 80	486	562	166	R 1"	12.1
S 100	486	667	166	R 1"	12.9
S 140	486	886	172	R 1"	19
S 200	640	758	205	R 1"	27.5
S 250	640	888	205	R 1"	32.4
S 300	640	1092	235	R 1"	47
S 400	746	1102	245	R 1"	61
S 500	746	1321	245	R 1"	72
S 600	746	1559	245	R 1"	87

Part No.

2006 634
2006 635
2006 636
2006 637
2006 638
2006 639
2006 640
2006 641
2017 376
2006 642
2017 384
2006 643
2017 385
2006 644
2017 386

Reflex V

In-line vessel made of sheet steel, from Reflex V 40 on feet. Designed for operating pressures up to 10 bar. Type V 6-20 for wall installation with clamping band (clamping band see accessories). V 200-300 flange PN 16

Reflex type	Ø D mm	H mm	h mm	A inches	Weight kg
V 6	206	244	-	R 3/4"	4
V 12	280	287	-	R 3/4"	3.3
V 20	280	360	-	R 3/4"	3.3
V 40	409	562	113	R 1"	9.7
V 60	409	732	172	R 1"	12.4
V 200	634	901	142	DN 40	35.2
V 300	634	1201	142	DN 40	48
V 350	640	1341	210	DN 40	51

2032 084
2032 085
2032 086
2057 249
2006 864
242 824
242 825
242 827

Further information

see "Various system components"

Accessories



Console with strap
for Reflex N 8-25, S 8-25, V 6-20
vertical installation
Vessel connection top or bottom

Part No.

242 878



Quick connection SU R 3/4" x 3/4"
for diaphragm pressure expansion tanks in
closed heating and cooling water plants.
With shut-off valve against unintended
closing and drain according
to DIN 4751 Part 2,
tested by TÜV
Connection R 3/4"
PN 10/120 °C

242 771



Quick connection SU R 1" x 1"
for diaphragm pressure expansion tanks in
closed heating and cooling water plants.
With shut-off valve against unintended
closing (check ball) and drain according
to DIN 4751 Part 2
tested by TÜV
Connection R 1" PN 10/120 °C

242 772

Services



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

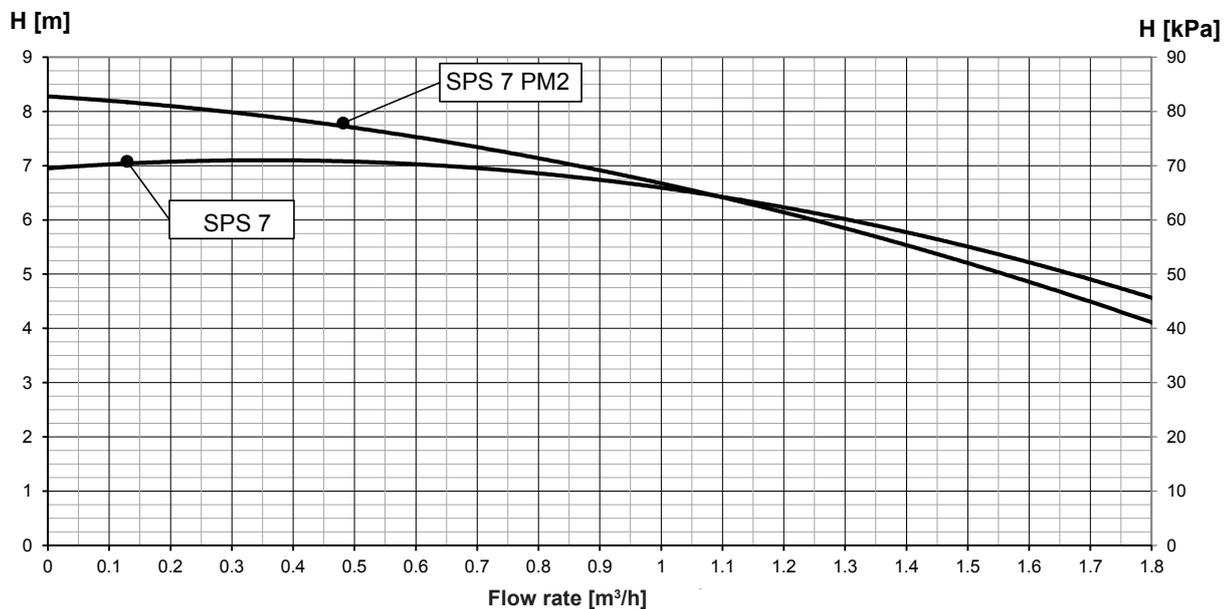
For commissioning and other services
please contact your Hoval sales office.

Solar armature groups

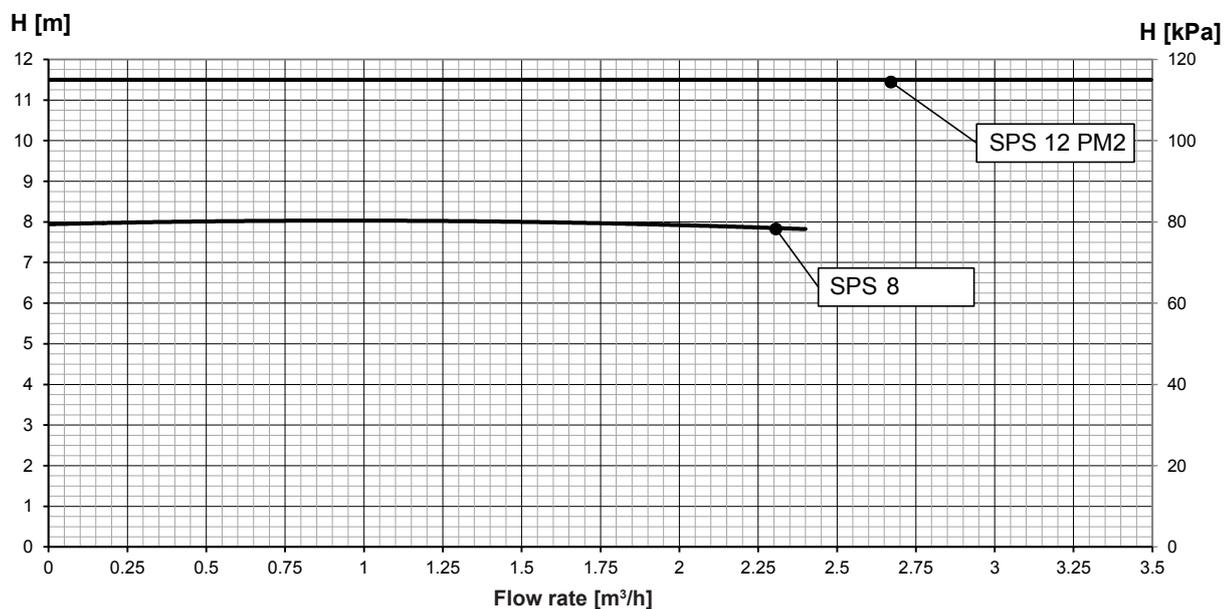
Type		SAR20	SAR20FR	SAG20	SAG20	SAG20FR	SAG25	SAG32
• Pump		SPS 7	SPS 7 PM2	SPS 7	SPS 7 PM2	SPS 7 PM2	SPS 8	SPS 12 PM2
• Voltage	V	1 x 230	1 x 230	1 x 230	1 x 230	1 x 230	1 x 230	1 x 230
• Maximum power consumption	W	45	45	45	45	45	130	310
• Maximum current	A	0.44	0.44	0.44	0.44	0.44	0.91	1.37
• Flow measuring range	Calibration valve	l/min	1-20	-	1-20	1-20	-	10-40 ¹⁾
	FlowRotor	l/min	-	0.5-15	-	-	0.5-15	1-35 ¹⁾
• Operating pressure	bar	6	6	6	6	6	6	6
• Maximum temperature temporary	°C	110	110	110	110	110	110	110

¹⁾ Optional accessory (recommended): calibration valve or FlowRotor

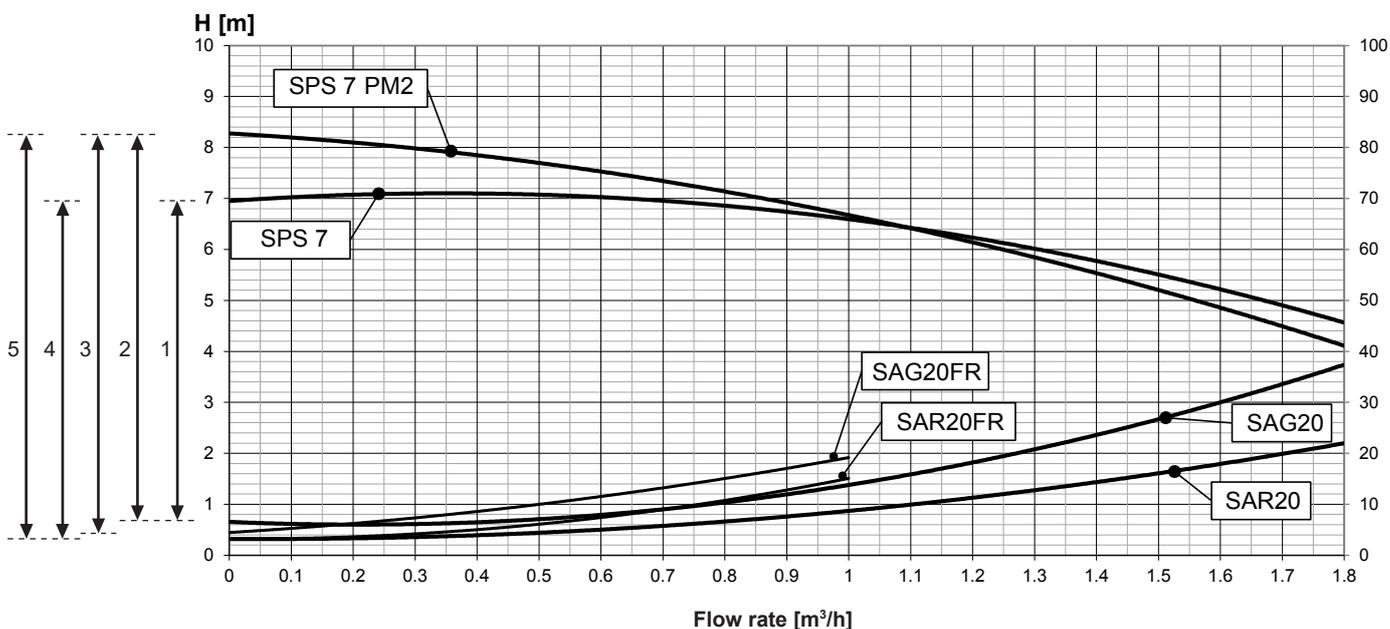
Pump characteristic curves SAG20 and SAR20



Pump characteristic curves SAG25 and SAG32



Residual overpressure SAG20, SAG20FR, SAR20 and SAR20FR

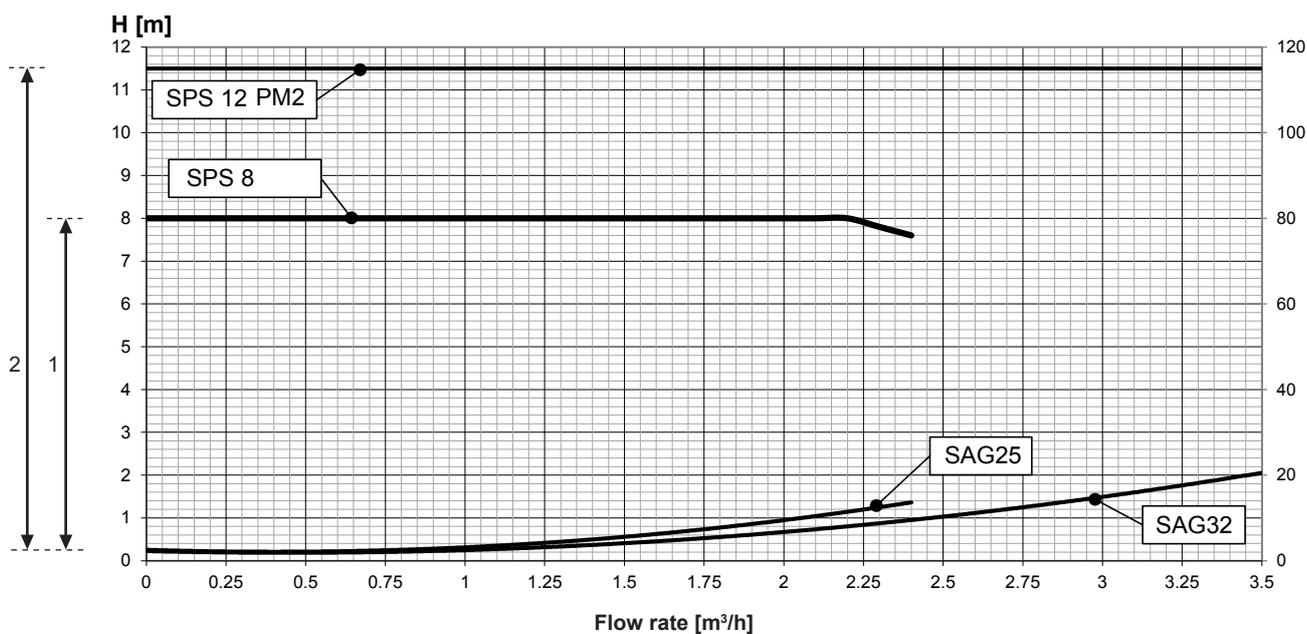


Max. residual overpressure

- 1 SAG20/SPS 7
- 2 SAG20/SPS 7 PM2
- 3 SAG20FR/SPS 7 PM2
- 4 SAR20/SPS 7
- 5 SAR20FR/SPS 7 PM2

1 mbar = 100 Pa = 0.1 kPa

Residual overpressure SAG25 and SAG32

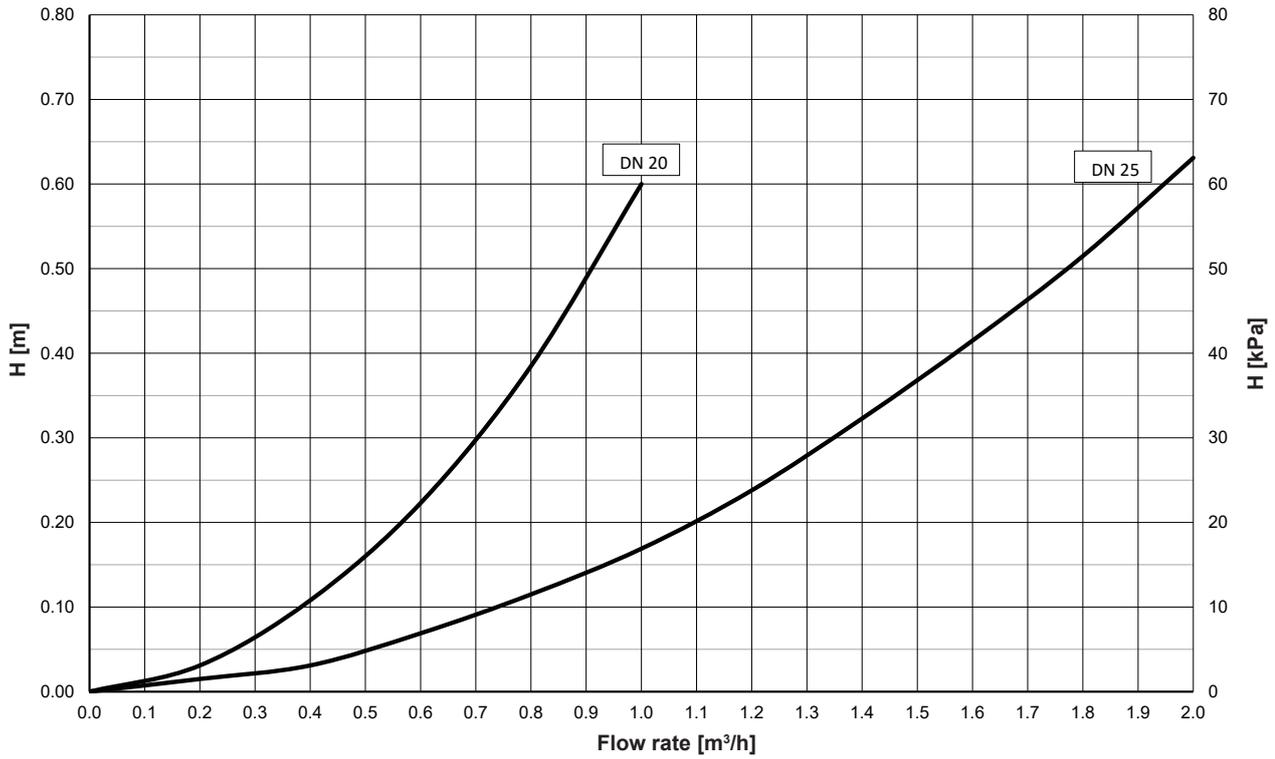


Max. residual overpressure

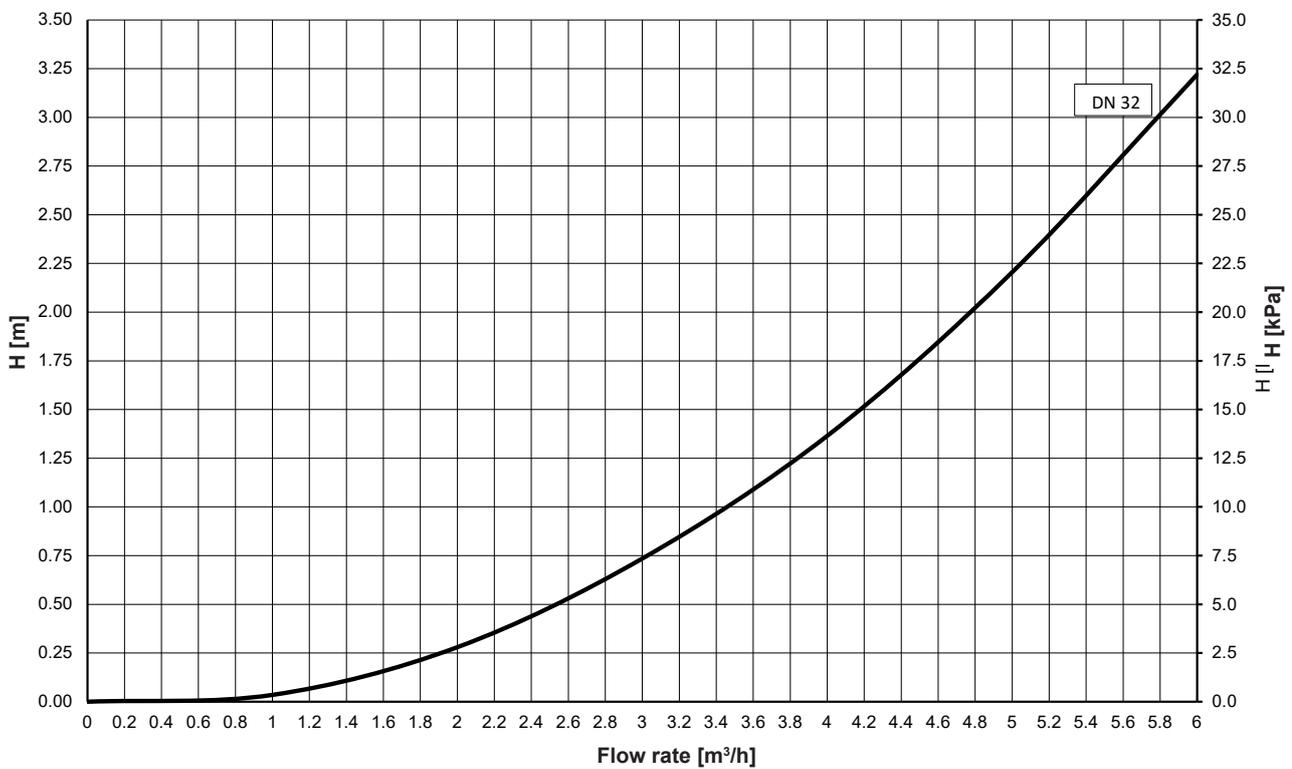
- 1 SAG25/SPS 8
- 2 SAG32/SPS 12 PM2

1 mbar = 100 Pa = 0.1 kPa

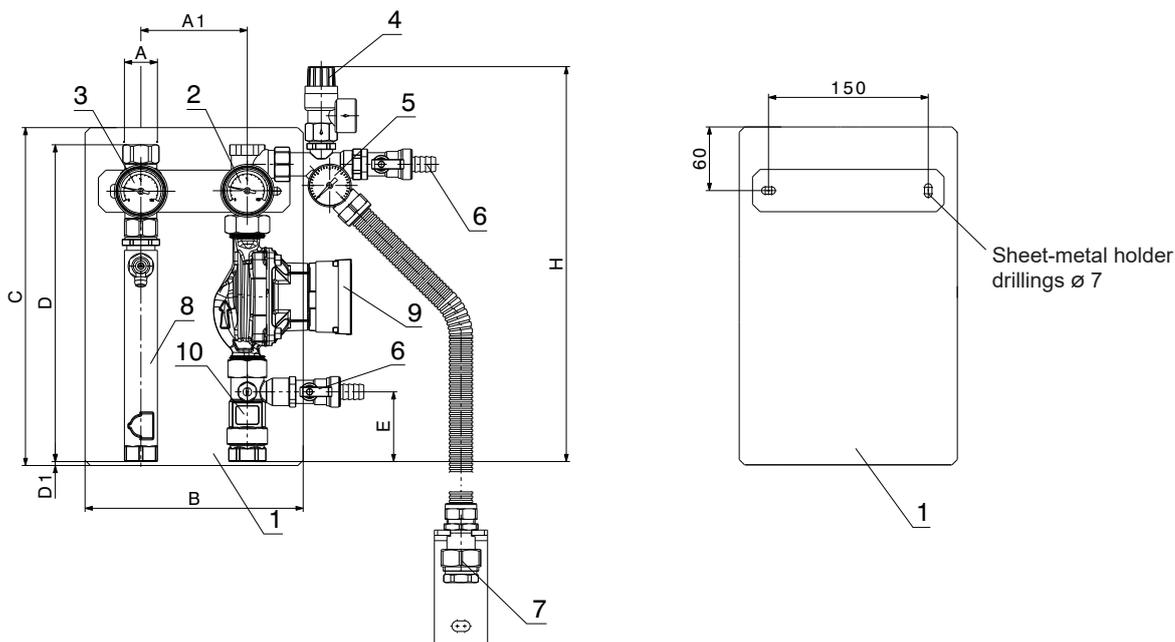
Pressure drop FlowRotor DN 20 and DN 25



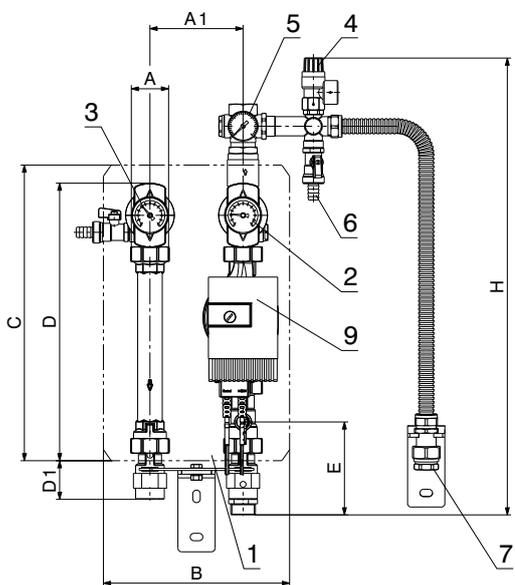
Pressure drop FlowRotor DN 32



Solar armature group SAG20



Solar armature group SAG25/32



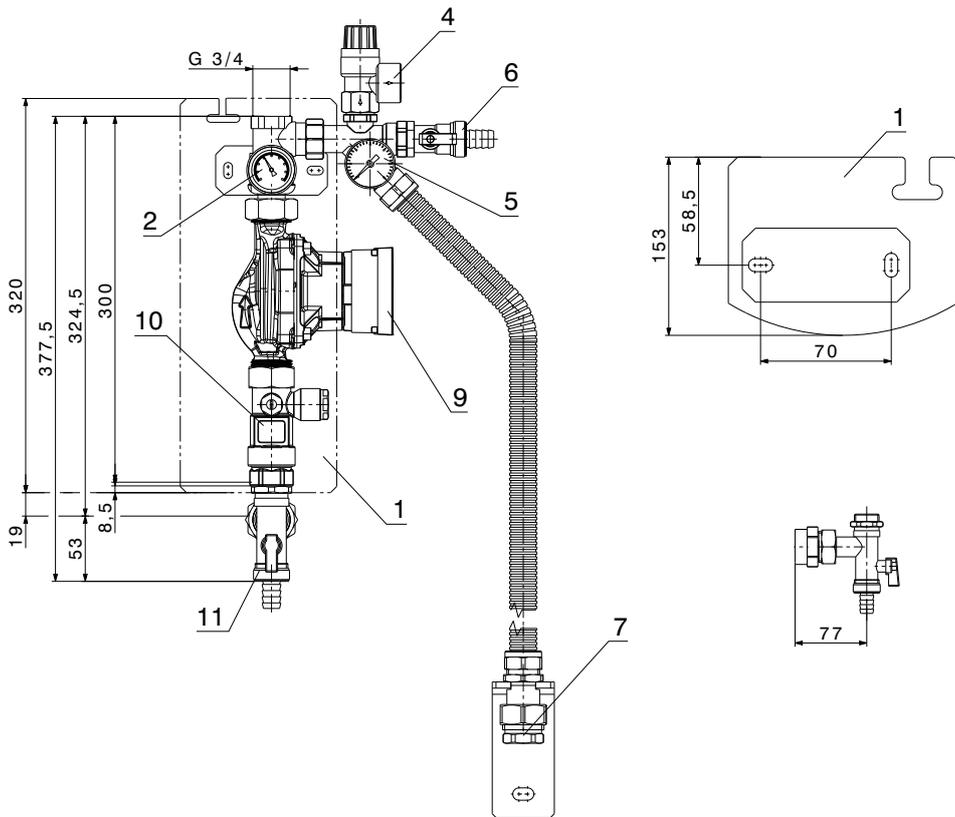
- 1 Insulation
- 2 Thermometer blue
- 3 Thermometer red
- 4 Safety valve
- 5 Pressure gauge 1/4" 0-6 bar
- 6 Ball valve with lock nut
- 7 Container connection coupling
- 8 AirStop
- 9 Solar pump
- 10 Flow meter

Wall mounting SAG 25/32

Bracket with variably adjustable distance to the wall

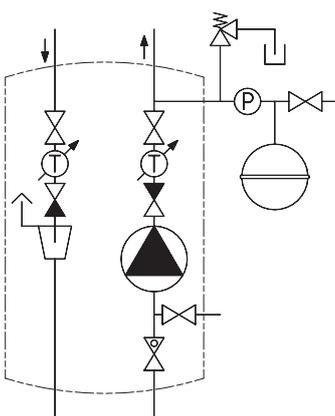
Type	A	A1	B	C	D	D1	E	H
DN 20	Rp 3/4"	100	205	320	300	7	66	371
DN 25	Rp 1"	125	250	380	340	89	172	744
DN 32	Rp 1 1/4"	125	250	440	400	52	126	618

Solar return armature group SAR20

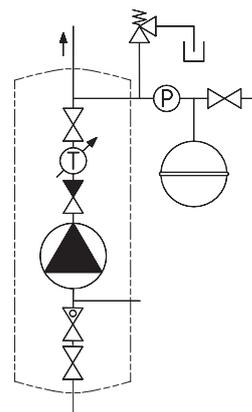


- 1 Insulation
- 2 Thermometer blue
- 4 Safety valve
- 5 Pressure gauge 1/4" 0-6 bar
- 6 Ball valve with lock nut
- 7 Container connection coupling
- 9 Solar pump
- 10 Flow meter
- 11 Ball valve with flange

Schematic diagram of the solar armature group SAG20

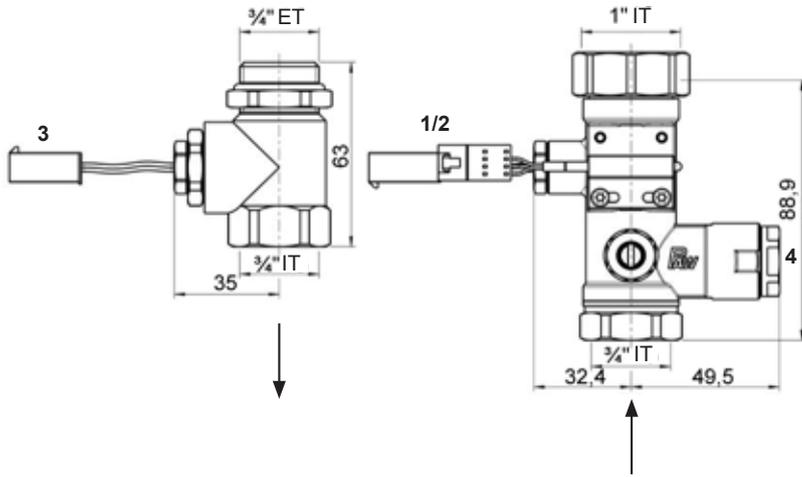


Schematic diagram of the solar return armature group SAR20



Kit FlowRotor

(Dimensions in mm)



- 1 Flow rate sensor
- 2 Temperature sensor for heat metering
- 3 Temperature sensor for heat metering
- 4 Flushing port

Dimensioning guidelines for diaphragm pressure expansion tanks of solar plants in the small range

The diaphragm pressure expansion tank is used for accommodating the expansion in volume of the heat carrier fluid in the solar circuit. Its size must be selected according to the applicable design regulations for diaphragm pressure expansion tanks.

If there is a possibility of the plant operating in standby mode for a long period, i.e. without heat output, it is necessary for the diaphragm pressure expansion tank to be able to hold the entire content of the collector array in addition to the expansion volume.

Circuit

The diaphragm pressure expansion tank must be arranged with a safety valve in the return to the collector which cannot be blocked off, as a result of which there is bound to be follow-up pressure maintenance, i.e. integration of the diaphragm pressure expansion tank on the pressure side of the circulating pump.

Selected example - solar installation, safety valve 6 bar:

Installation with 6 UltraSol® 2 collectors vertical
System height 15 m

Take account of the following for the effective expansion volume in litres:

1. Volume: Collector field volume and flow at 100 %
Plant volume at 10 % incl. heat exchanger
2. Useful volume of the diaphragm pressure expansion tank depending on the system height.

6 UltraSol® 2 collectors vertical of	2.5 litres	at 100 %	15.0 l
Flow	12.5 litres	at 100 %	12.5 l
Return	12.5 litres	at 10 %	1.25 l
Heat exchanger	37 litres	at 10 %	3.7 l
Expansion volume			32.5 l

Min. preliminary pressure:
System height + 0.3 bar = 1.8 bar (18 m)
In the table, select the next-higher preliminary pressure: 2 bar
If the diaphragm pressure expansion tank is connected on the pressure side of the pump, the pressure value of the pump must be included in calculation to prevent cavitation.
System height + pump pressure + 0.3 bar

selected:
diaphragm pressure expansion tank type
Reflex N 80/6

Intermediate tank (if $t_R > 70$ °C!)
Contents collectors = 15.2 litres
selected:
intermediate tank type **V20**

Selection table Reflex N/S

Type	with safety valve 6 bar Capacity V_N of the empty tank in litres with a pre-pressure of						
	1.5 bar	2 bar	2.5 bar	3 bar	3.5 bar	4 bar	
18/6	L	8	6	5	4	2	1
25/6	L	12	10	8	6	4	3
35/6	L	17	15	13	10	7	5
50/6	L	26	22	19	15	12	8
80/6	L	41	36	31	26	20	15
100/6	L	51	45	38	32	26	19
140/6	L	72	63	54	45	36	27
200/6	L	103	90	77	64	51	38
250/6	L	128	112	96	80	64	48
300/6	L	154	135	115	96	77	58
400/6	L	205	180	154	128	103	77
500/6	L	256	224	192	160	128	96
600/6	L	308	269	231	192	154	115
800/6	L	410	359	308	256	205	154
1000/6	L	513	449	385	321	256	192
Maximum possible system height*		12 m	17 m	22 m	27 m	32 m	37 m

* System height = middle of diaphragm pressure expansion tank up to the uppermost point on the heating system / solar installation

Execution:
A system-based configuration is mandatory!

Hoval Solar charging modules

- TransTherm® solar (25), DN 20 (¾")**
- TransTherm® solar (50), DN 20 (¾")**
- TransTherm® solar (100), DN 25 (1")**
- TransTherm® solar (200), DN 40 (1½")**

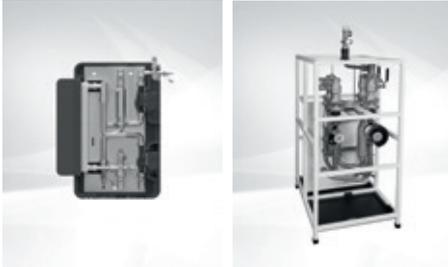
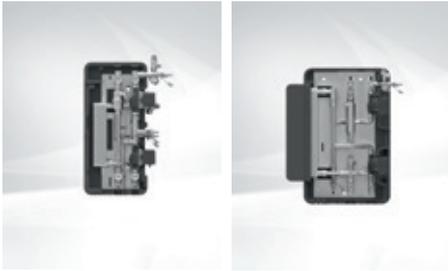
- Solar charging module for the transfer of heat from the primary circuit (solar circuit) to the secondary circuit (buffer storage tank; secondary side not suitable for direct domestic water heating)
- Circulating pump pre-installed for primary and secondary circuit
- Flow rate sensor FlowRotor with PT1000 sensors installed in the primary circuit
- Balancing valve installed in the secondary circuit
- TransTherm® solar (25):
4 ball valves with thermometer
- TransTherm® solar (50-200):
4 ball valves
- Gravity brake in flow and return of primary circuit and in return of secondary circuit
- Stainless steel plate heat exchanger
- Permanent exhaust valve AirStop
- Safety devices:
 - safety valve (6 bar) for the primary circuit
 - pressure gauge
 - flexible connection hose made of stainless steel for the diaphragm pressure expansion tank and
 - safety valve for the secondary circuit
 - TransTherm® solar (25): 3 bar
 - TransTherm® solar (50-200): 6 bar
- Rinsing and filling unit
- Heat damming box made of EPP half shells
- Wall mounting plate

Delivery

- Solar charging module packed



Solar heat transfer stations



Hoval TransTherm® solar charging modules

type	Possible measuring range l/min	Pump primary circuit Typ	Pump secondary circuit Typ
(25)	0.5-15	UPM3 15-145 ¹⁾	UPM3 15-75 ¹⁾
(50)	2-50	UPM3 15-145 ¹⁾	UPM3 15-75 ¹⁾
(100)	2-50	PML 25-145 ¹⁾	UPM3 25-75 ¹⁾
(200)	5-130	UPM XL 25-125 ¹⁾	UPML 25-105 ¹⁾

Part No.

6037 694
6037 695
6037 696
6037 697

¹⁾ Variable flow rate possible (PWM);
FlowRotor installed in the primary circuit
Optional accessories secondary circuit
(recommended): FlowRotor
Operation only possible with PWM-capable controller, both pumps are equipped with PWM signal "Solar" (TopTronic® E/UNI-FE)

Accessories



FlowRotor kit

for performance related control, system monitoring and heat metering
 Consisting of:
 Proximity-type flow rate sensor and PT1000 sensors
 Pre-assembled ready for connection, sensor cable included
 Operating temperature: max. 120 °C
 DN 20: can be installed in the insulation of an SAG/SAR20
 DN25/32: can be installed under an SAG25/32

DN	Measuring range [l/min]	Connection inches
20	0.5-15	3/4"
25	1-35	1"
32	5-100	1 1/4"

Part No.

6037 631
 6037 632
 6037 693



Switching ball valve VBI60...L
DN 15-40, PN 40, -10...120 °C

- Ball valve body made of brass
- Connections with internal thread Rp acc. to ISO 7-1
- Leakage rate: 0 ... 0.0001 % of Kvs value

DN	Connection inches	kvs m³/h
15	Rp 1/2"	5
20	Rp 3/4"	9
25	Rp 1"	9
32	Rp 1 1/4"	13
40	Rp 1 1/2"	25

6052 422
 6052 443
 6052 444
 6052 445
 6052 446



Motor drive GLB341.9E

For straight-way ball valves VAG60.. and switching ball valves VBI60.. DN 15..50
 Operating voltage: 230 V, 50/60 Hz
 Control signal 2-point/3-point
 Single-wire/2 wire control
 Operating time: 150 s
 Nominal torque: 10 Nm
 Permitted ambient temperature: -32 °C to +55 °C

2070 331

For further accessories

see "Solar control systems", "Solar armature groups" or "Various system components" chapter

Services



Commissioning

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

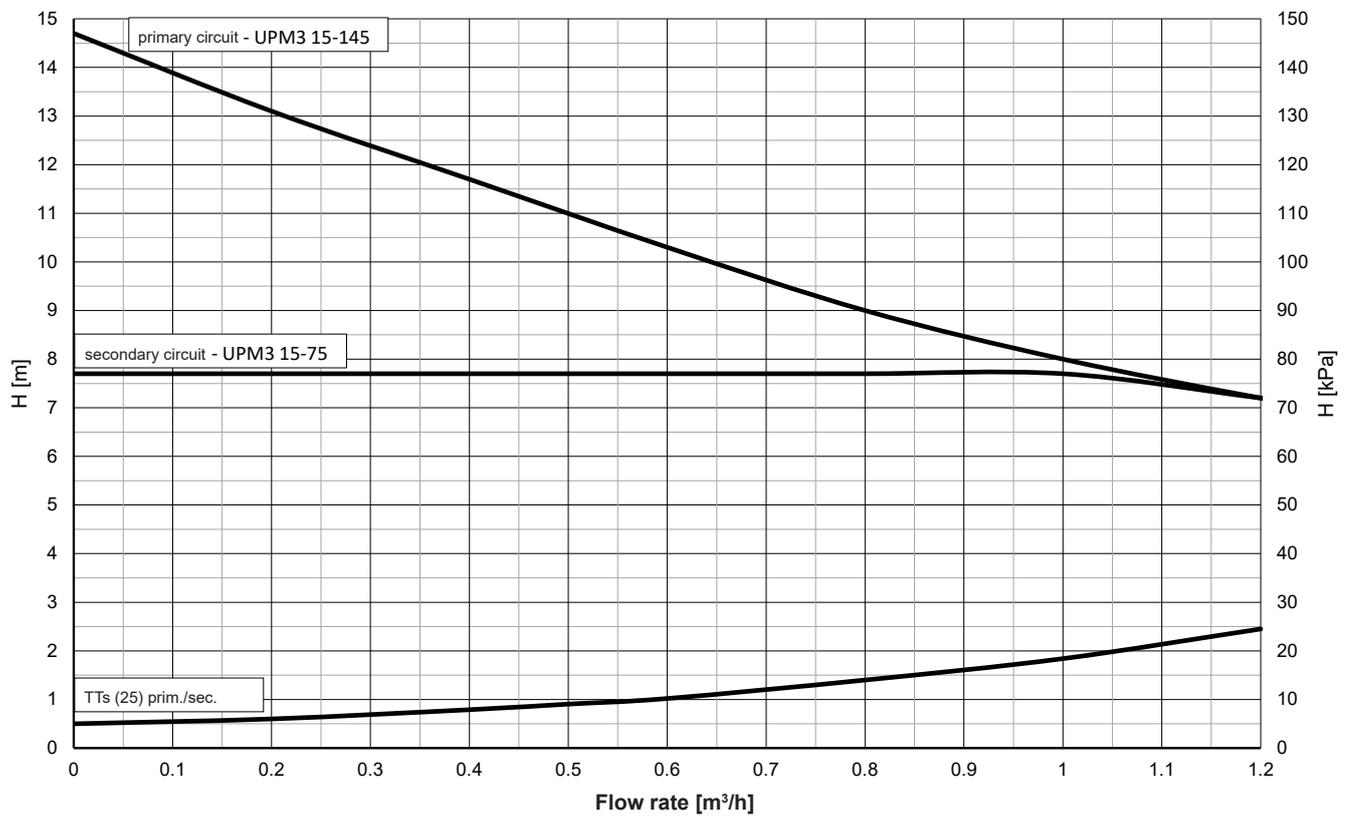
For commissioning and other services please contact your Hoval sales office.

TransTherm® solar (25-200)

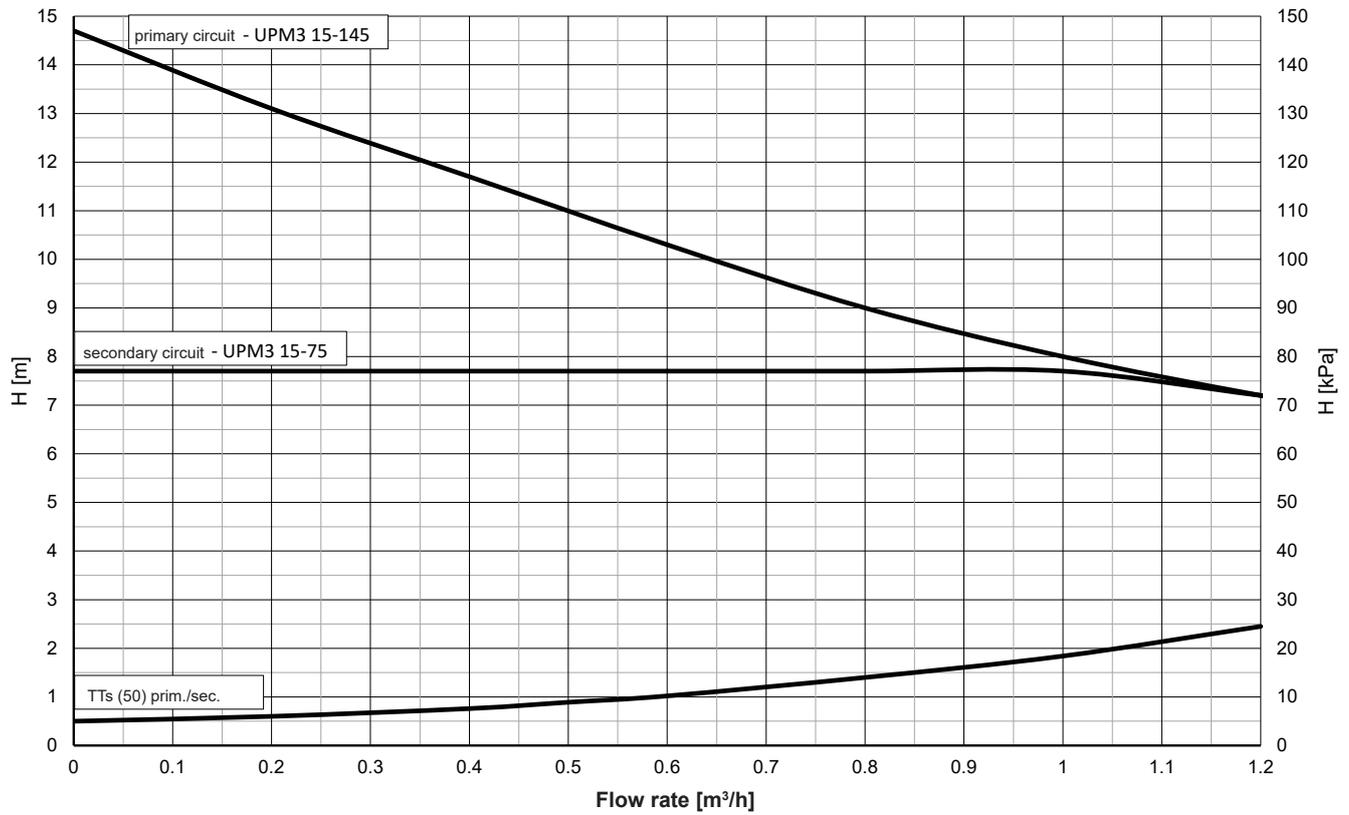
Type		(25)	(50)	(100)	(200)
Pump - primary circuit		UPM3 15-145	UPM3 15-145	PML 25-145	UPM XL 25-125
Pump - secondary circuit		UPM3 15-75	UPM3 15-75	UPM3 25-75	UPML 25-105
Voltage	V	1 x 230	1 x 230	1 x 230	1 x 230
Max. power consumption - primary/secondary circuit	W	60/45	60/45	140/45	180/140
Max. current - primary/secondary circuit	A	0.58/0.48	0.58/0.48	1.1/0.48	1.4/1.1
Max. pressure - primary/secondary circuit	bar	6/3	6/6	6/6	6/6
Max. temperature - primary/secondary circuit	°C	120/95	120/95	120/95	120/95
Max. temperature temporary primary/secondary circuit	°C	160/120	160/120	160/120	160/120
Flow measuring range	l/min	0.5-15 ¹⁾	2-50 ¹⁾	2-50 ¹⁾	5-130 ¹⁾
Collector surface up to approx.	m ²	25	50	100	150

¹⁾ Optional accessories secondary circuit (recommended): balancing valve or FlowRotor

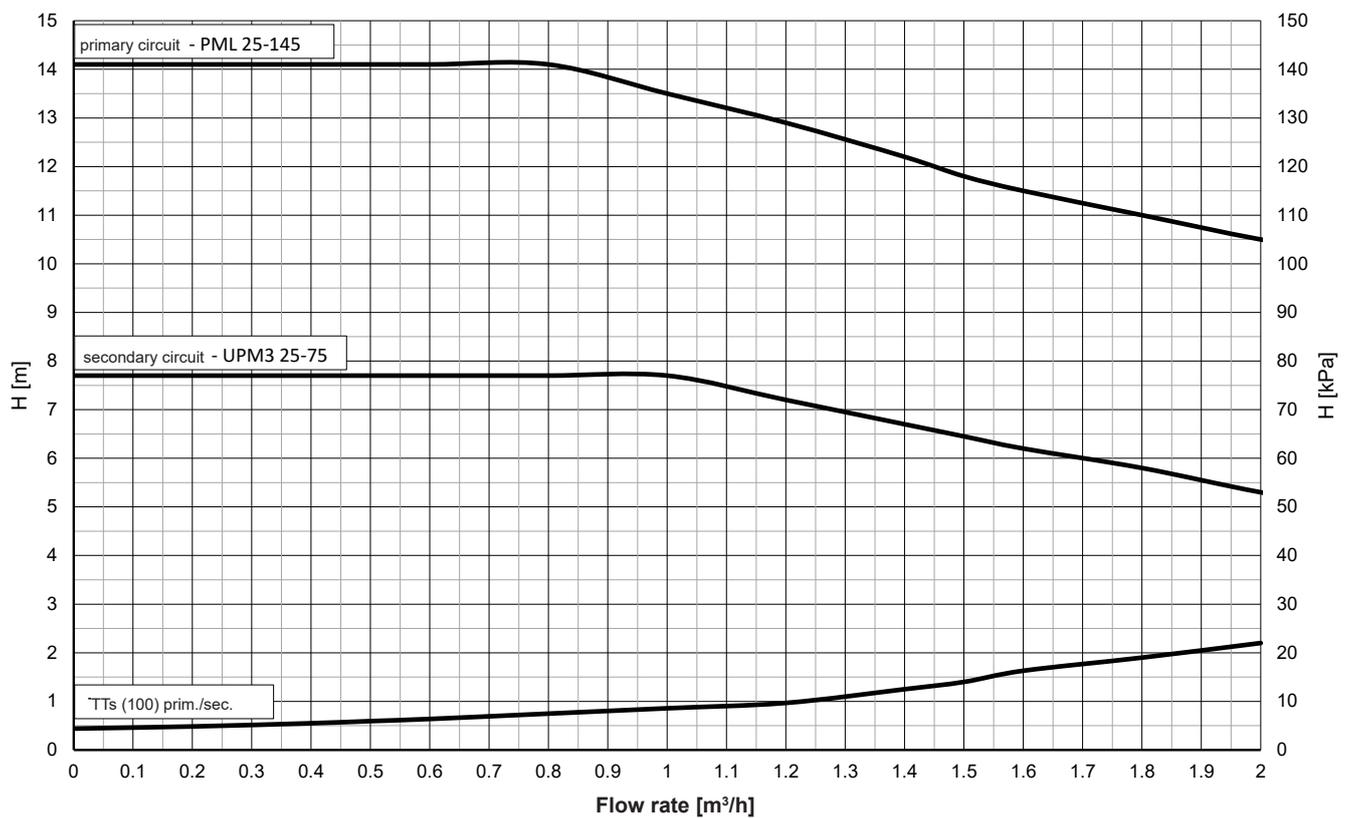
Residual overpressure TransTherm® solar (25)



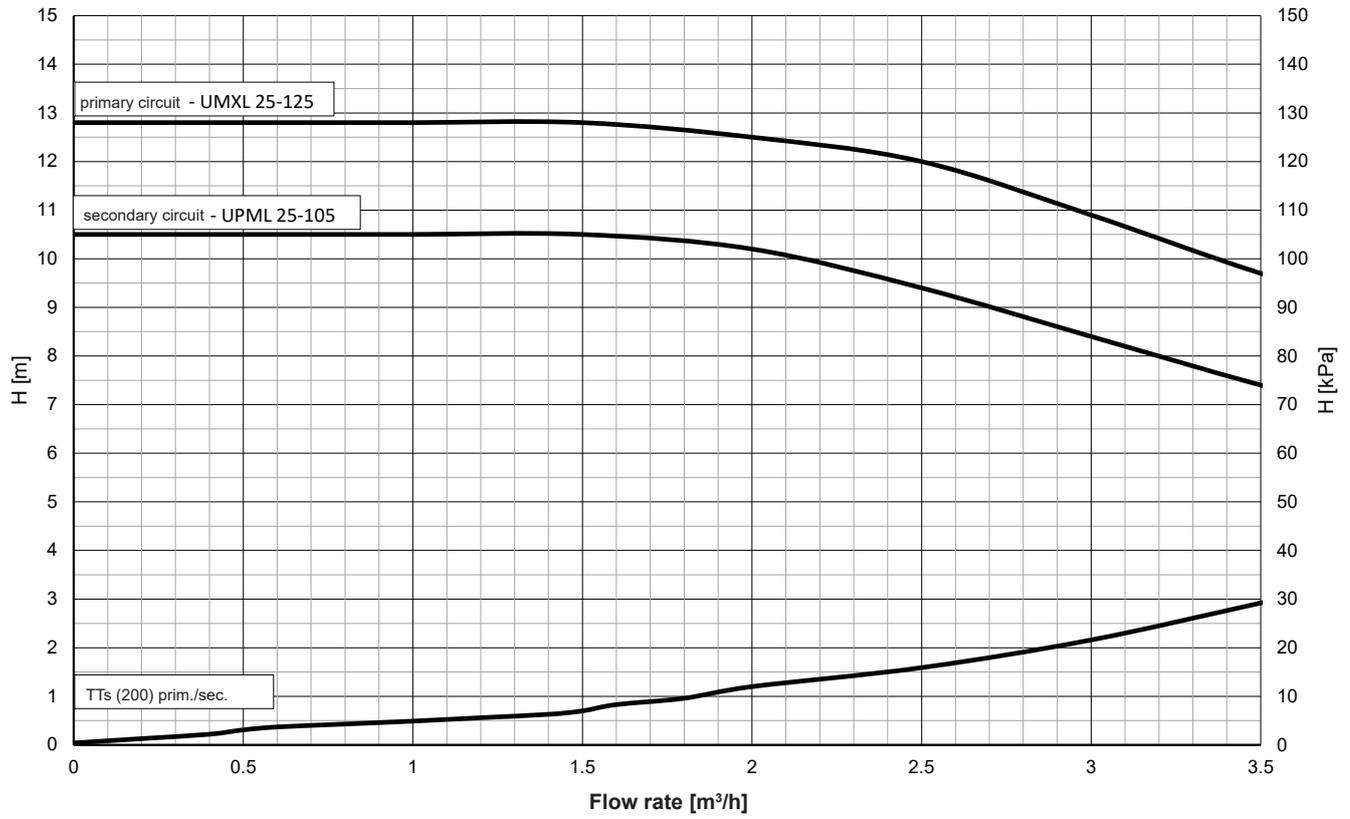
Residual overpressure TransTherm® solar (50)



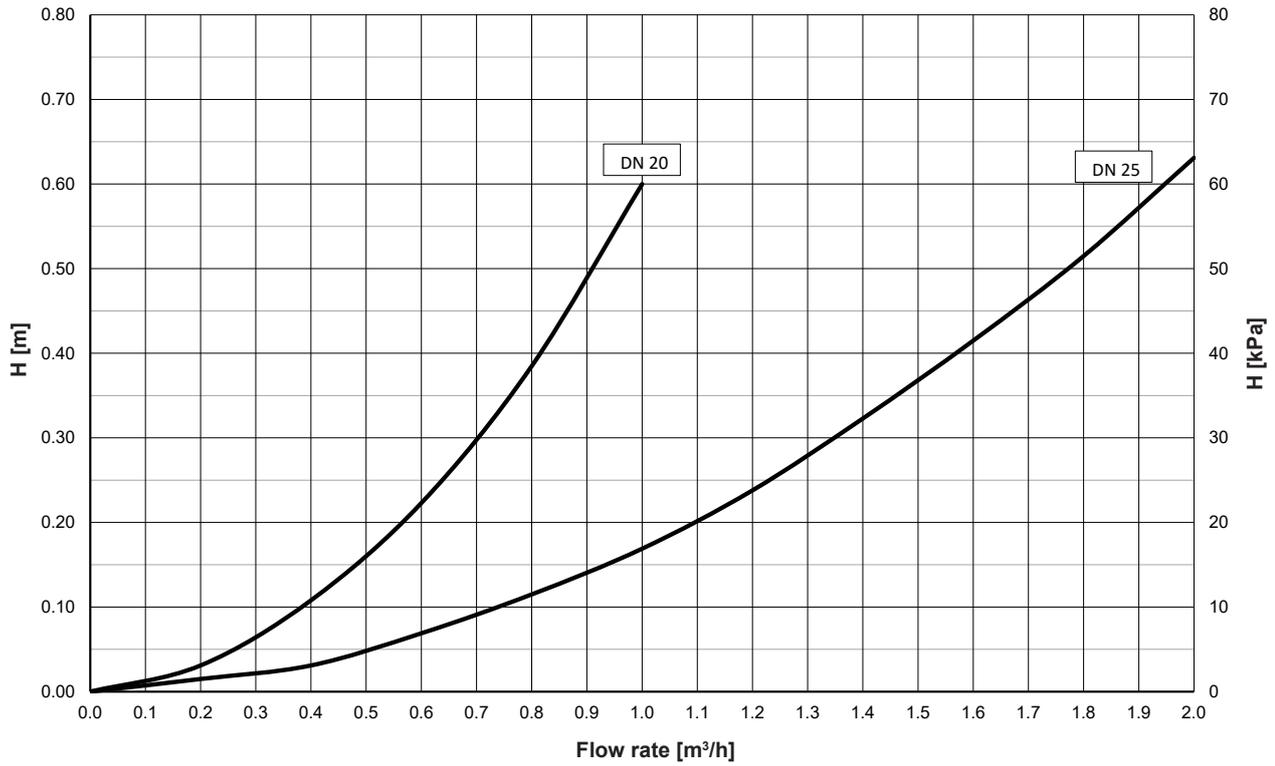
Residual overpressure TransTherm® solar (100)



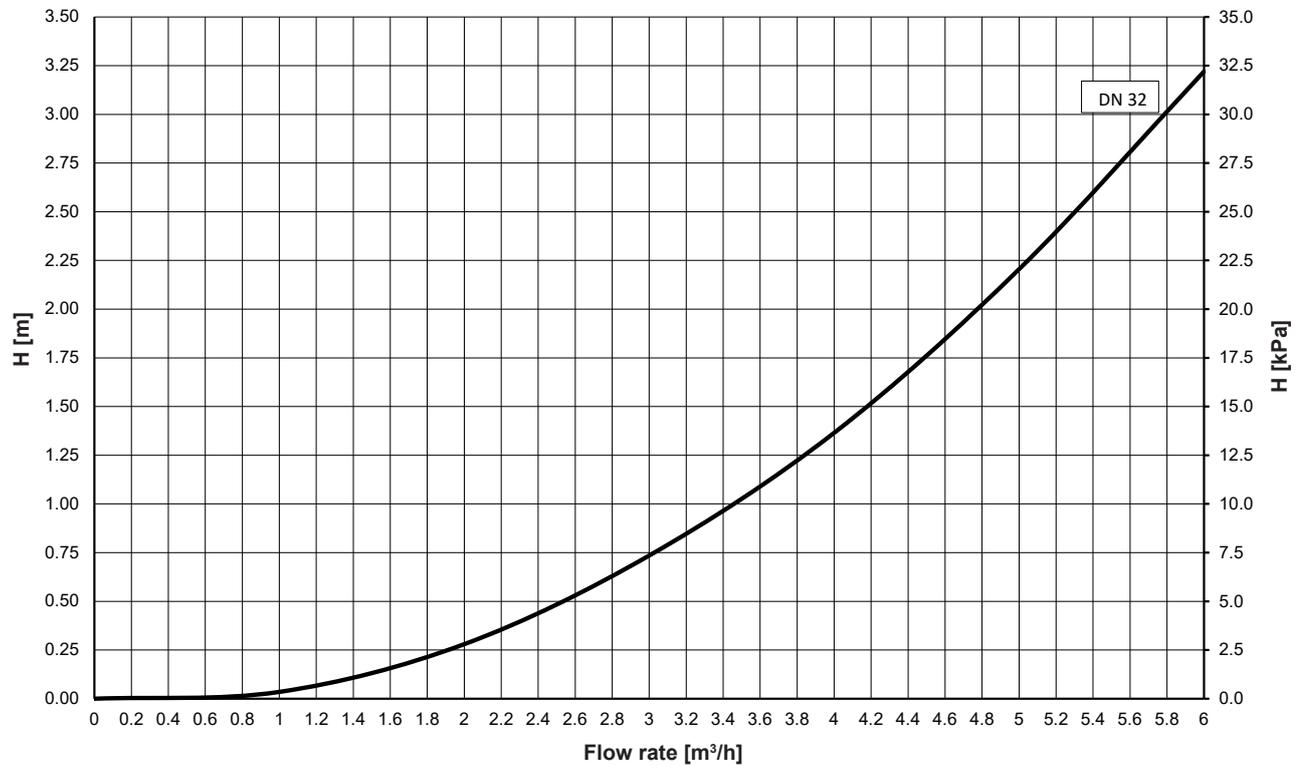
Residual overpressure TransTherm® solar (200)



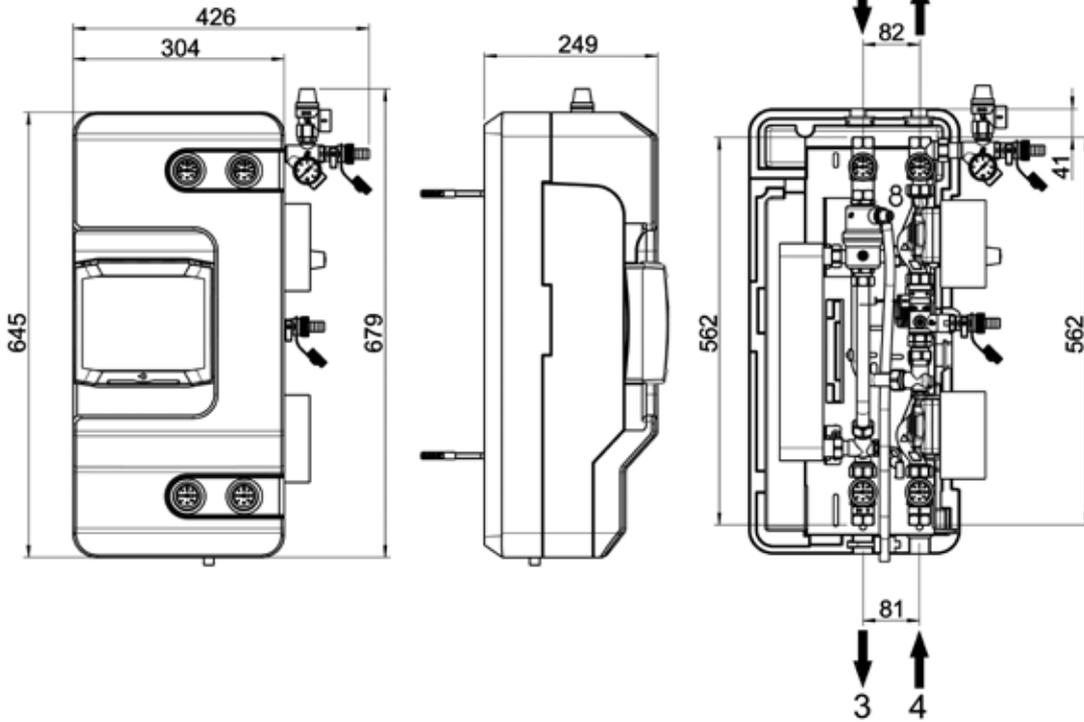
Pressure drop FlowRotor DN 20 and DN 25



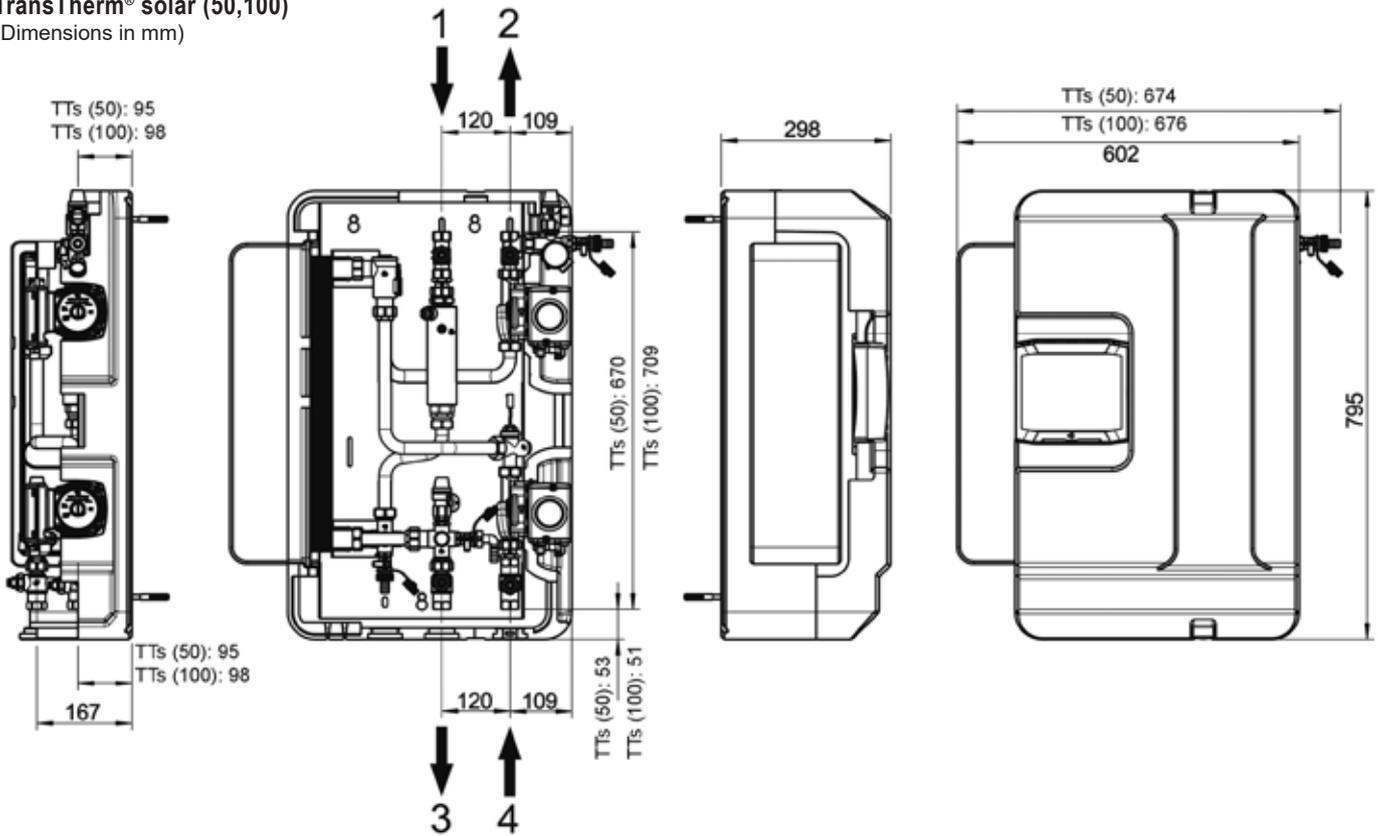
Pressure drop FlowRotor DN 32



TransTherm® solar (25)
(Dimensions in mm)



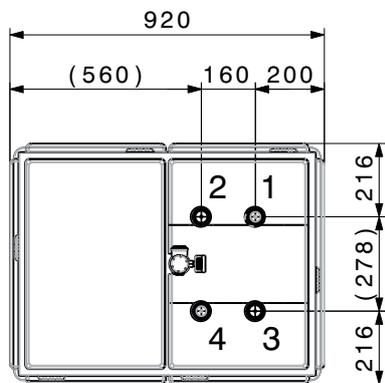
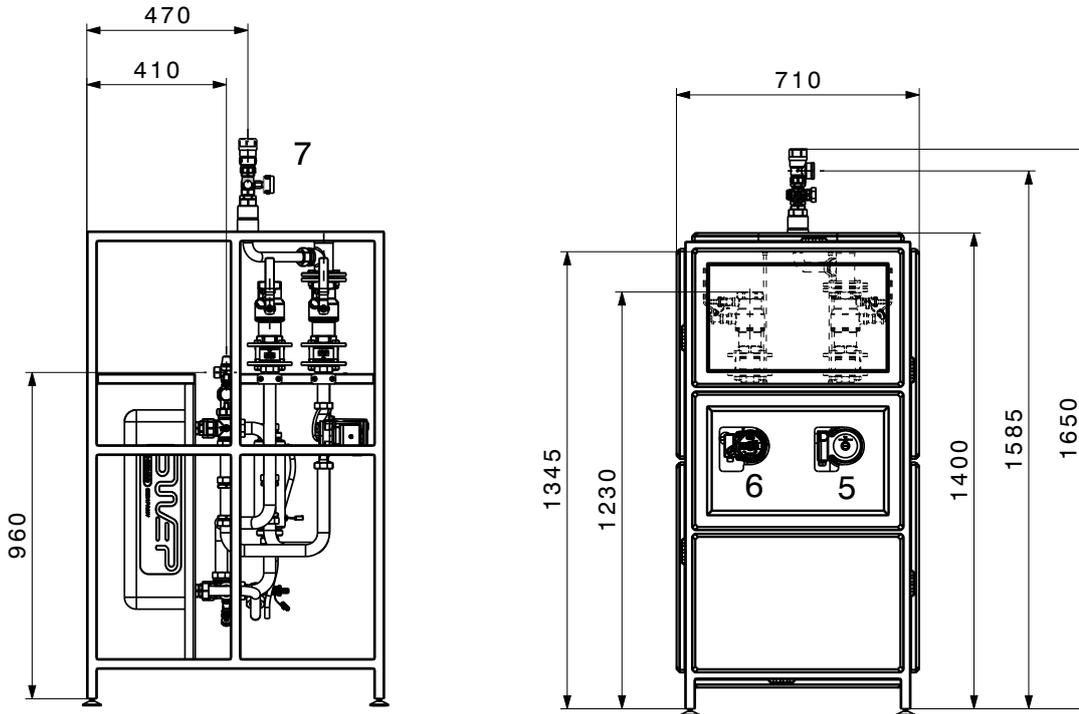
TransTherm® solar (50,100)
(Dimensions in mm)



Connection dimensions TransTherm® solar (25-100)

TransTherm® solar	(25)	(50)	(100)
1 Solar flow	Rp 3/4"	Rp 3/4"	Rp 1"
2 Solar return	Rp 3/4"	Rp 3/4"	Rp 1"
3 Heating flow	Rp 3/4"	Rp 3/4"	Rp 1"
4 Heating return	Rp 3/4"	Rp 3/4"	Rp 1"

TransTherm® solar (200)
(Dimensions in mm)



- TransTherm® solar (200)
- 1 Solar flow Rp 1½"
 - 2 Solar return Rp 1½"
 - 3 Heating flow Rp 1½"
 - 4 Heating return Rp 1½"
 - 5 Solar pump
 - 6 Heating pump
 - 7 Safety valve/pressure gauge

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

TopTronic® E solar module

- The controller module is suitable for use as differential temperature control, control of thermal solar plants, for heating process water and/or heating support.
- The controller module contains predefined hydraulic applications for different applications or plants.
- The solar yield calculation calculates the current output, the split yield in kWh as well as the total yield in MWh.
- Control unit with integrated regulating functions for:
 - One/two circuit solar energy plants
 - integrated heat balancing
 - Various additional functions
- Connection technology executed as plug-in screw terminals in coded RAST 5 design
- Update capability of the controller software
- Time and date via integrated RTC, multi-year spring reserve
- Fine fuse 10 A
- Control unit suitable for cabinet installation thanks to ability to install on DIN rail 35 x 15 x 2.2 mm
- Expansion possibilities via Hoval CAN bus:
 - max. 16 controller modules in the bus system
 - max. 16 solar modules in the bus system



Notice
Max. 2 module expansions can be connected.

 TopTronic® E module expansion Universal

 TopTronic® E module expansion Universal

Notice

Operation of the controller module is generally via the TopTronic® E control module installed in the heat generator!
If the control module is used without Hoval heat generator, the control module for operating the solar module and a wall casing with control module cut-out must be ordered separately!

Inputs and outputs

- 3 variable sensor inputs:
 - 2 variable inputs for connection of a sensor
 - 1 variable input for connection of a sensor or pulse sensor
- 0-10 V input
- 0-10 V or PWM output for controlling a variable-speed pump
- Connection of a flow rate sensor (pulse sensor), e.g. for heat metering
- Variable 230 V 3-point output
- Variable 230 V output, e.g. for controlling a solar charging pump
- 230 V optocoupler input connected in series to the variable 230 V output

Option

- Can be expanded by max. 2 module expansions (expansion of the inputs/outputs):
 - Module expansion universal

Functions

- Simple configuration and parameter setting of the plant by predefined hydraulic and function applications
- 41 pre-programmed basic variants
- Differential temperature control
- Integrated solar yield calculation
- Storage tank cascade with up to 4 consumers
- Loading and unloading function for buffer
- Cooling down function
- Overheating and frost protection
- Forced energy/high-temperature discharge

- Collector cascade with up to 2 collector fields
- Charging via plate heat exchanger
- Heat exchanger cascade
- Additional functions, e.g. recharging function, circulating pump, etc.
- Start help function
- Consumer loading with type selection
- High temperature discharge
- Fault reporting output
- Return flow increase
- Forced energy/high-temperature discharge on storage tank or buffer maximum temperature
- Relay test for each output can be activated separately
- Self-test with error diagnosis and error memory
- Functions that can be implemented with module expansions:
 - Multi-circuit solar plants with up to 4 consumers
 - 2 collector fields
 - misc. application functions acc. to heating system diagrams

Notice

Depending on the complexity of the corresponding system hydraulics, module expansions are required for using the listed functions (max. 2 module expansions can be connected)!

Use

- Control of thermal solar plants with differential temperature control for heating process water and/or heating support

- For one/two-circuit solar plants with varying complexity with integrated heat balancing
- For decentralised assembly - remote from the control module - directly at the sensors and actuators (solar regulating armature located a long way away):
 - Installation in wall casing/control panel
 - Connection to the operating unit via Hoval CAN bus
- With significant expansion capability by controller modules via the Hoval CAN bus
- For flexible integration in modern communication systems via different interface modules
- For remote connection via HovalConnect

Delivery

- TopTronic® E solar module incl. 2 mounting clips for DIN rail attachment
- DIN rail with fitting accessories
- 1 immersion sensor TF/2P/5/6T, L = 5.0 m
- 1 collector sensor TF/1.1P/2.5S/5.5T, L = 2.5 m
- Basic plug set for controller module
 - Mains in
 - Plug for 230 V output (VA3)
 - Plug for 2 x 230 V output (VA1/VA2)
 - Plug for optocoupler input (SK-VA3)
 - 2 plugs for sensor (VE1/VE2)
 - Plug for 0-10 V output (VA10V/PWM)
 - Plug for Hoval CAN bus

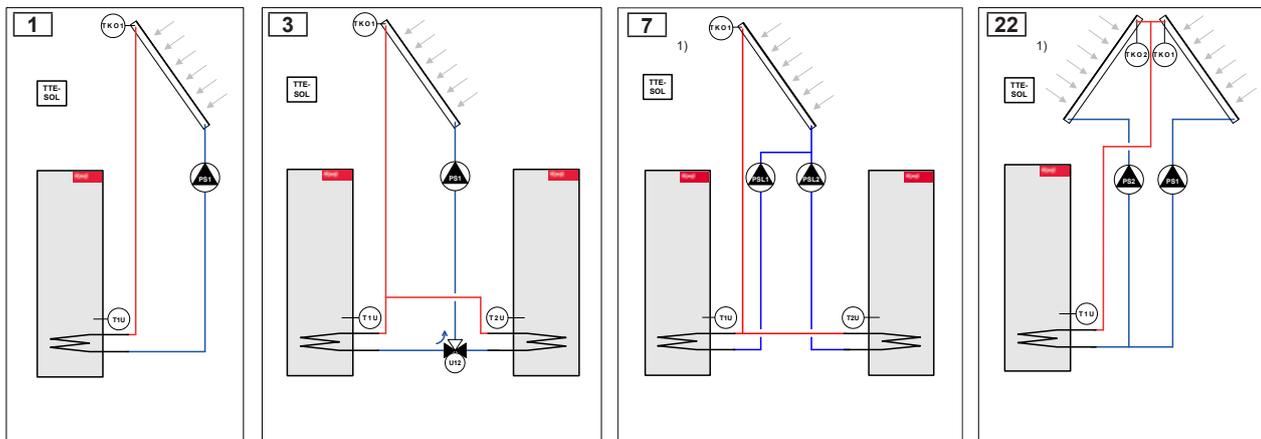
Notice

The supplementary plug set may have to be ordered to implement functions differing from the standard!

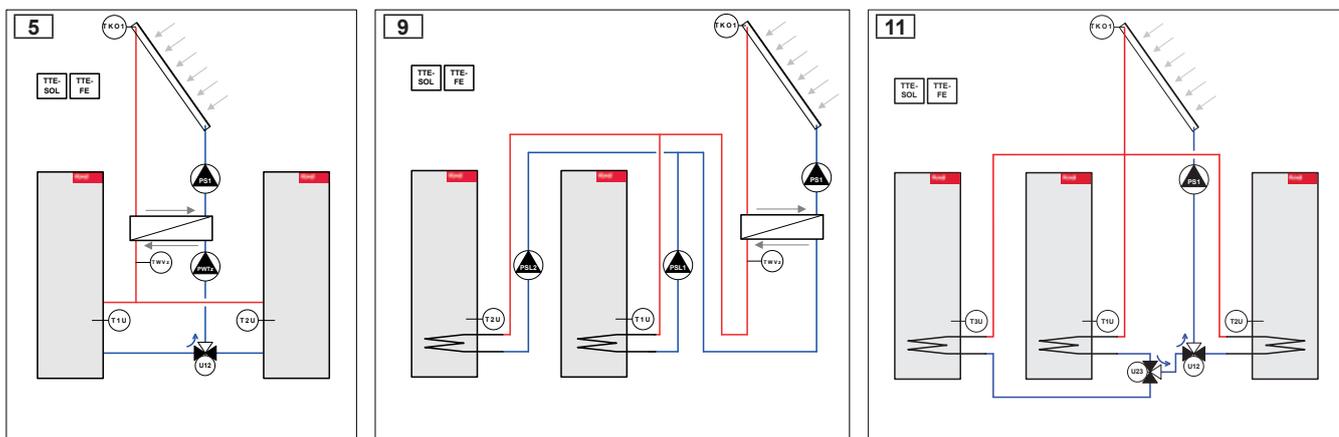
Functions that can be implemented

TopTronic® E solar module

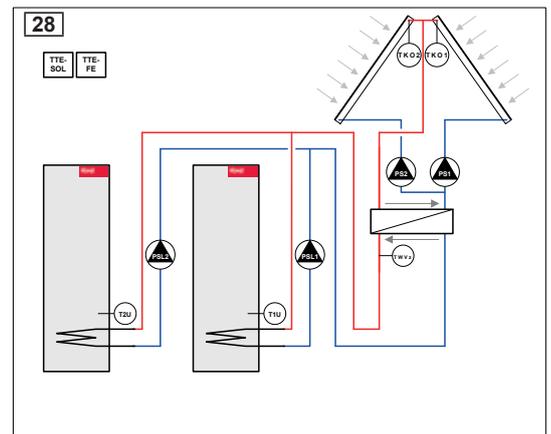
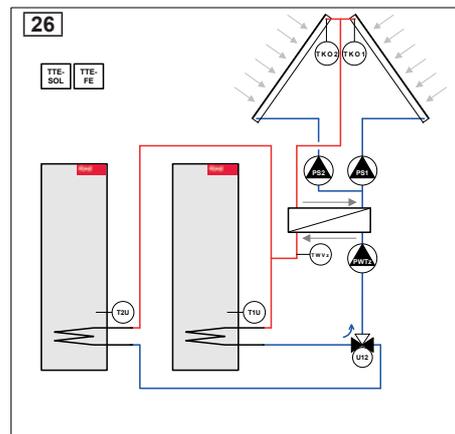
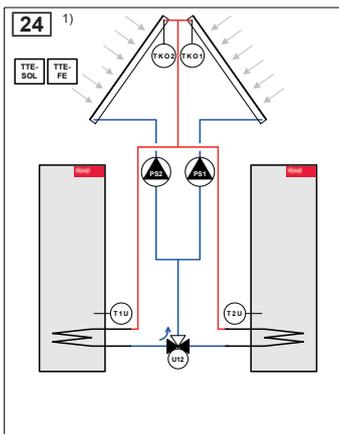
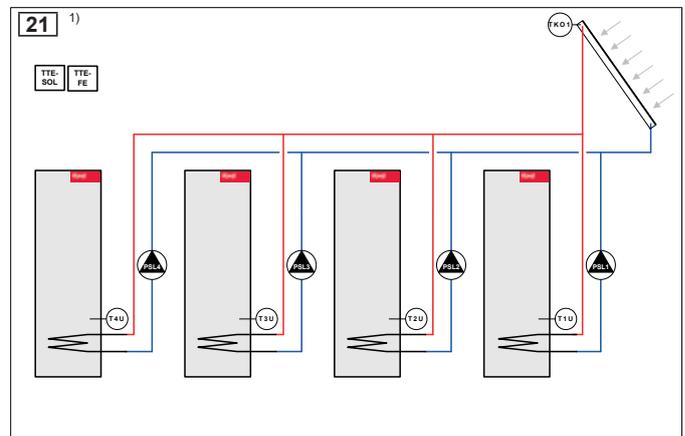
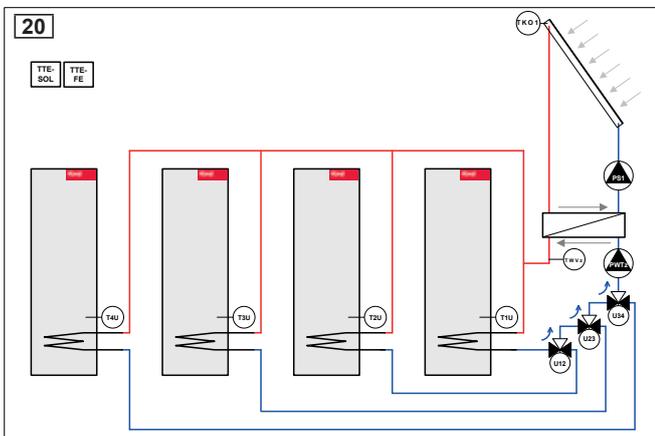
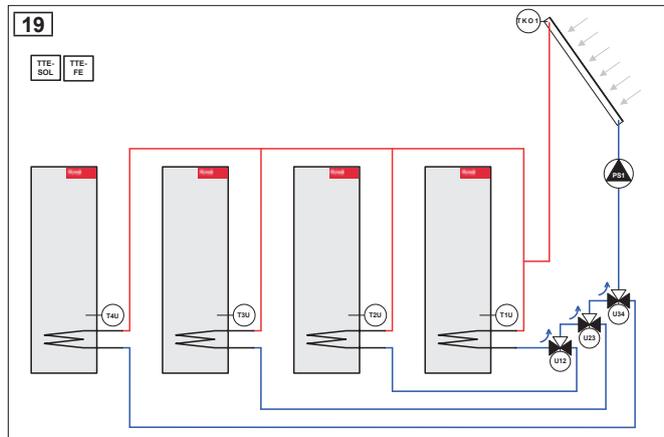
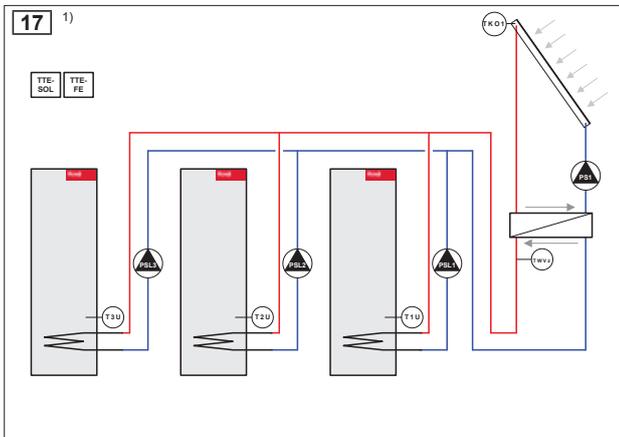
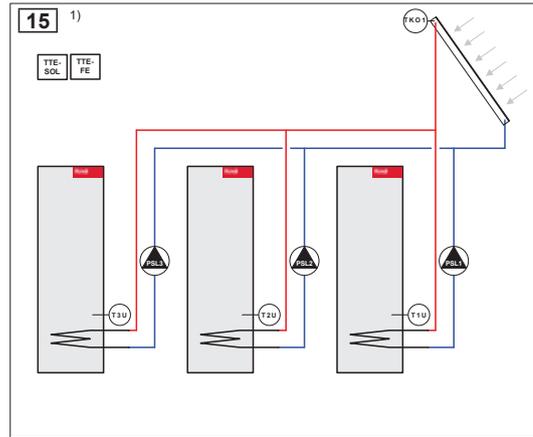
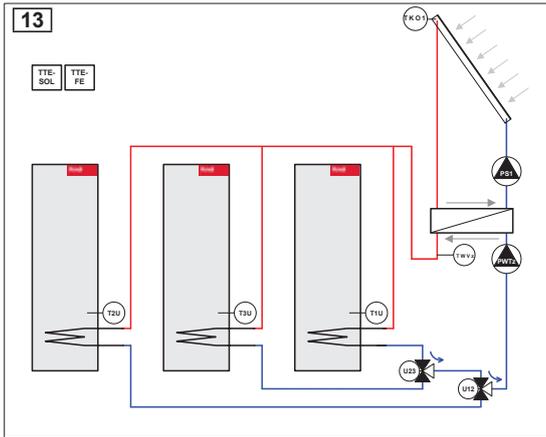
TTE-SOL	1 collector	2 collectors	Ext. HE	1 consumer	2 consumers	3 consumers	4 consumers	Change-over unit	Shut-off unit
Hydr. 1	•			•					
Hydr. 3	•			•	•			•	
Hydr. 5	•		•	•	•			•	
Hydr. 7	•			•	•				
Hydr. 9	•		•	•	•				
Hydr. 11	•			•	•	•		•	
Hydr. 13	•		•	•	•	•		•	
Hydr. 15	•			•	•	•			
Hydr. 17	•		•	•	•	•			
Hydr. 19	•			•	•	•	•	•	
Hydr. 20	•		•	•	•	•	•	•	
Hydr. 21	•			•	•	•	•		
Hydr. 22		•		•					
Hydr. 24		•		•	•			•	
Hydr. 26		•	•	•	•			•	
Hydr. 28		•	•	•	•				
Hydr. 30		•		•	•	•		•	
Hydr. 32		•	•	•	•	•		•	
Hydr. 34		•		•	•	•	•	•	
Hydr. 35		•	•	•	•	•	•	•	
Hydr. 36	•		•	•	•	•			•
Hydr. 37	•		•	•	•	•			•
Hydr. 38	•		•	•	•	•	•		•
Hydr. 39		•	•	•	•	•			•
Hydr. 40		•	•	•	•	•			•
Hydr. 41		•	•	•	•	•	•		•



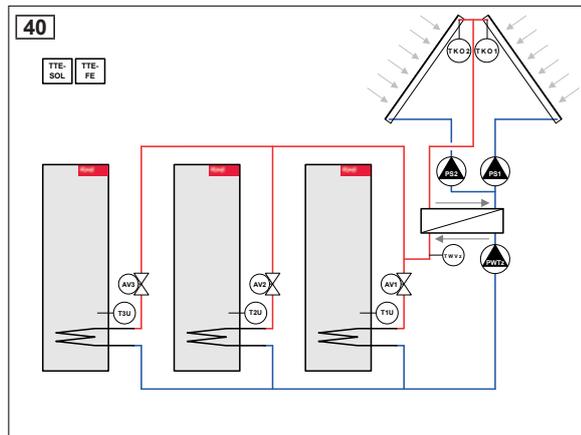
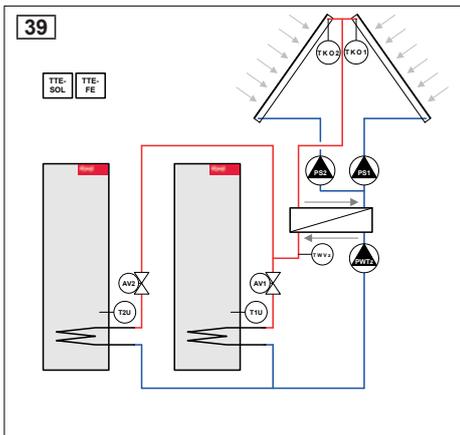
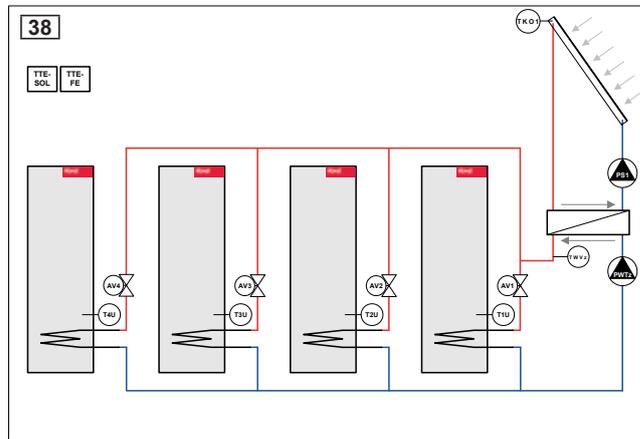
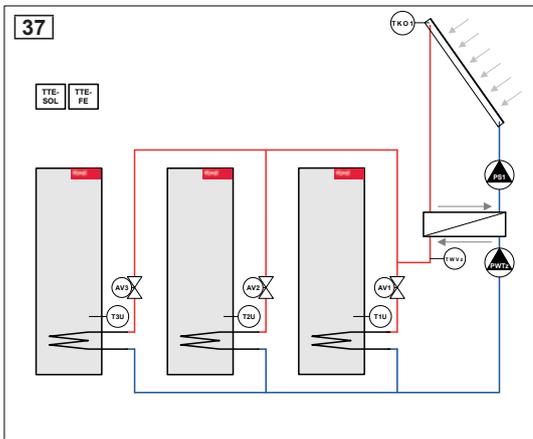
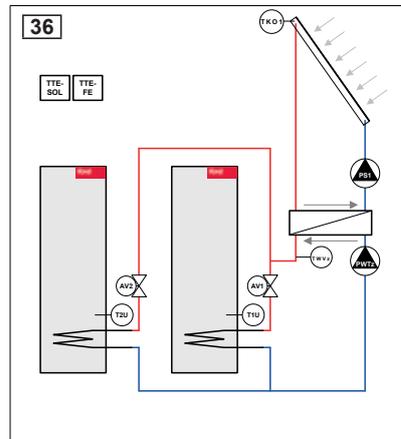
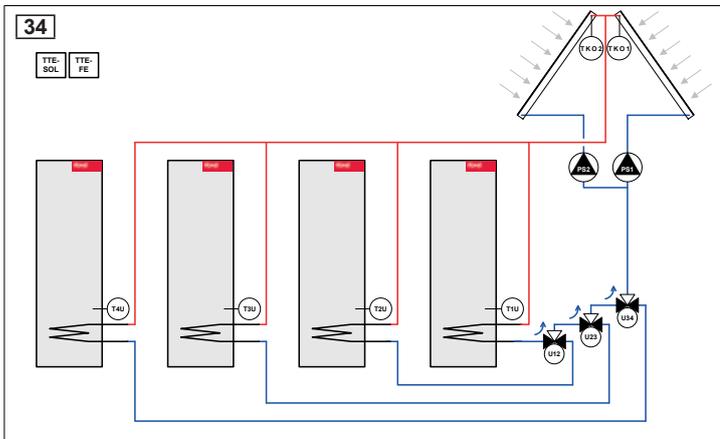
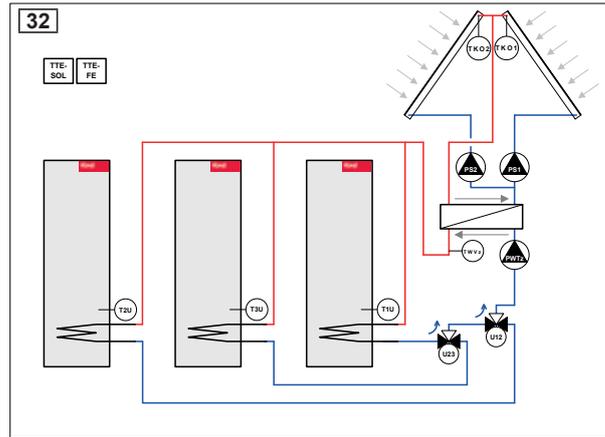
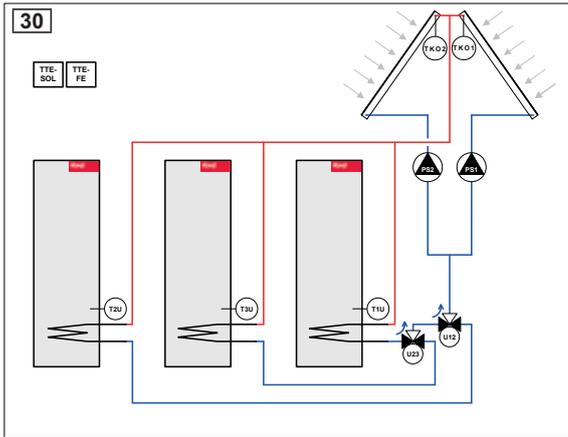
TopTronic® E solar module and 1 module expansion



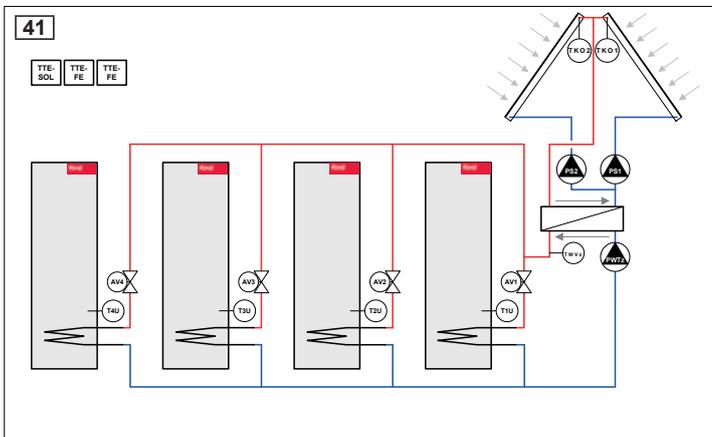
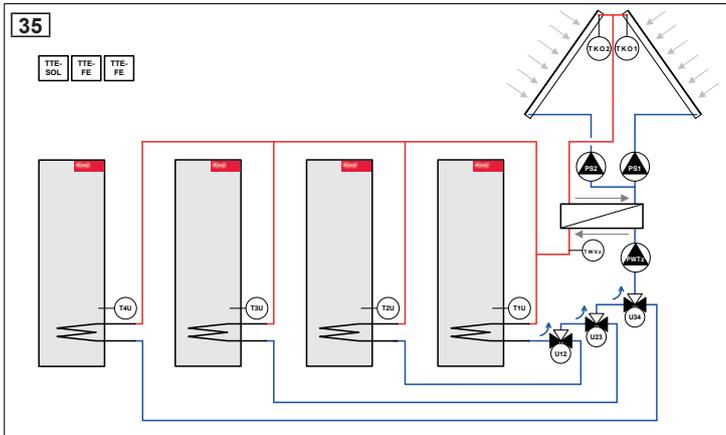
1) When using several variable-speed pumps, an additional function expansion is required.



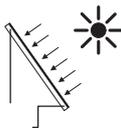
¹⁾ When using several variable-speed pumps, an additional function expansion is required.



TopTronic® E solar module and 2 module expansions



TopTronic® E controller module



TopTronic® E solar module TTE-SOL

The controller module is suitable for use as temperature differential control, control of thermal solar plants, for heating process water and/or heating support.

Controller module with integrated control functions for

- solar circuit
- collector cascade
- storage tank cascade with up to 4 consumers
- consumer loading, with type selection
- temperature differential control
- loading and unloading function for additional/reserve buffer tank
- Integrated solar yield calculation

Consisting of:

- Fitting accessories
- 1 immersion sensor TF/2P/5/6T, L = 5 m
- 1 collector sensor TF/1.1P/2.5S/5.5T L = 2.5 m
- Basic plug set for controller module

Notice

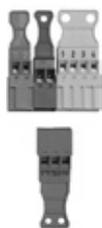
In a standalone application, the control module for operating the solar module and a wall casing must be ordered separately!!

Notice

Depending on the complexity, module expansions are required for using the listed functions (max. 2 module expansion can be connected)!

Notice

The supplementary plug set may have to be ordered to implement functions differing from the standard!



Supplementary plug set for controller modules and module expansion TTE-FE HK

Consisting of RAST 5 mating plugs for connecting further sensors and actuators on the controller module or on the module expansion.

The controller module is already equipped with a basic plug set, the supplementary plug set is required for advanced functions.

Consisting of:

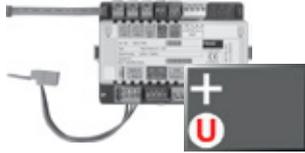
- Plug for mains out (230 V)
- Plug for sensor (VE3) (variable input)
- Plug for 0-10 V input (VE10V)
- Plug for flow rate sensor input (FVT)

Part No.

6037 058

6034 503

TopTronic® E module expansion
for TopTronic® E solar module



Max. 2 expansions can be connected.

TopTronic® E module expansion
Universal TTE-FE UNI

Expansion to the inputs and outputs of a controller module (basic module heat generator, heating circuit/domestic hot water module, solar module, buffer module) for implementing various functions

Consisting of:

- Fitting accessories
- Plug set FE module

Notice

Refer to the Hoval System Technology to find which functions and hydraulic arrangements can be implemented.

Part No.

6034 575

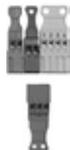
Accessories for TopTronic® E



TopTronic® E controller modules

- TTE-HK/WW TopTronic® E heating circuit/
hot water module
- TTE-PS TopTronic® E buffer module
- TTE-MWA TopTronic® E measuring module

- 6034 571
- 6037 057
- 6034 574



Supplementary plug set

for basic module heat generator TTE-WEZ

6034 499



TopTronic® E control module

TTE-BM black

6043 844



TopTronic® E room control modules

- TTE-RBM TopTronic® E room control modules
- easy white
- comfort white
- comfort black

- 6037 071
- 6037 069
- 6037 070



Enhanced language package TopTronic® E

one SD card required per control module

Consisting of the following languages:

- HU, CS, SL, RO, PL, TR, ES, HR,
- SR, JA, DA

6039 253



HovalConnect

- HovalConnect LAN
- HovalConnect WLAN
- HovalConnect Modbus
- HovalConnect KNX

- 6049 496
- 6049 498
- 6049 501
- 6049 593

TopTronic® E interface modules

GLT module 0-10 V

6034 578



TopTronic® E sensors

- AF/2P/K Outdoor sensor
- H x W x D = 80 x 50 x 28 mm
- TF/2P/5/6T Immersion sensor, L = 5.0 m
- ALF/2P/4/T Contact sensor, L = 4.0 m
- TF/1.1P/2.5S/6T Collector sensor, L = 2.5 m

- 2055 889
- 2055 888
- 2056 775
- 2056 776



Bivalent switch

for various release or switching functions

- Bivalent switch 1-piece
- Bivalent switch 2-piece

- 2056 858
- 2061 826



System housing

- System housing 182 mm
- System housing 254 mm

- 6038 551
- 6038 552



TopTronic® E wall casing

- WG-190 Wall casing small
- WG-360 Wall casing medium
- WG-360 BM Wall casing medium with
control module cut-out
- WG-510 Wall casing large
- WG-510 BM Wall casing large with
control module cut-out

- 6052 983
- 6052 984
- 6052 985
- 6052 986
- 6052 987

Further information
see "Controls"

Part No.



Solar controller set WM complete

for wall mounting
 consisting of a black housing incl.
 TopTronic® E solar module
 1x immersion sensor TF/2P/5/6T, L = 5 m
 1x collector sensor TF/1.1P/2.5S/5.5T,
 L = 2.5 m
 Basic connector set
 Blind cover for control module cut-out
 incl. wall mounting material

6027 257

TopTronic® E control module as an option



Solar controller set AG complete

for mounting on regulating armature
 SAG20 or SAR20
 consisting of a black housing incl.
 TopTronic® E solar module
 1x immersion sensor TF/2P/5/6T, L = 5 m
 1x collector sensor TF/1.1P/2.5S/5.5T,
 L = 2.5 m
 Basic connector set
 Blind cover for control module cut-out

6037 492

TopTronic® E control module as an option

Services



Commissioning

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

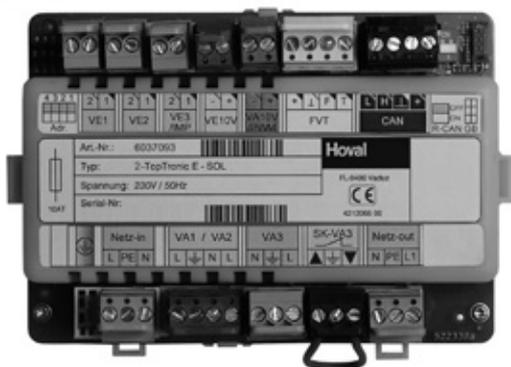
For commissioning and other services
 please contact your Hoval sales office.

TopTronic® E solar module

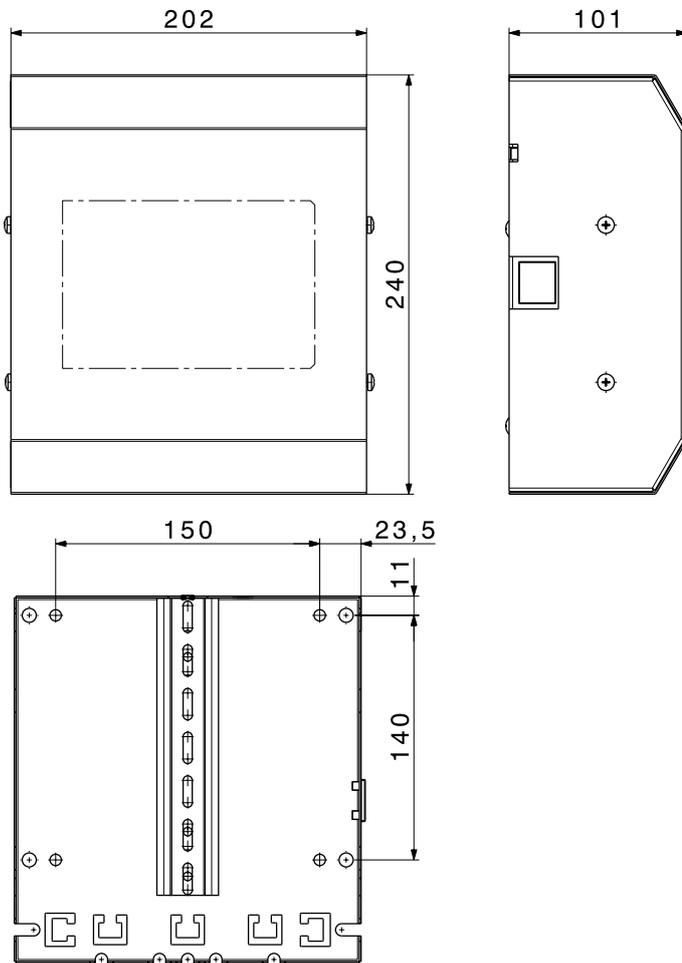
Type		TTE-SOL
• Power supply max		230 V AC +6/-10 %
• Frequency	Hz	50-60
• Max. power consumption incl. bus supply, module expansions, approx.	W	18.9
• Min. power consumption	W	0.8
• Max. power consumption	W	7.8
• Fuse		T 10 A H 250 V
Output (low voltage)		
• Electromechanical relays		3
Output (extra-low voltage)		
• Signal output PWM or 0-10 V		1
Switching capacity		
• Electromechanical relays	A	3
Input (low voltage)		
• Optocoupler input		1
Inputs (extra-low voltage)		
• Input 0-10 V		1
• Inputs sensors		2
• Inputs flow rate sensor		1
• Pulse input (can be switched over to sensor)		1
• Voltage measuring circuit, with protective isolation 2.9 kV	V	15
Expansion (module expansion)		
• Max. number		2
Casing		
• Installation		Top hat rail mounting
• Dimensions (W x H x D) incl. plug	mm	150 x 100 x 75
• Ambient temperature (during operation)	°C	0...50
• Humidity (in operation), non-condensing	%, RH	20...80
• Storage temperature	°C	0...50
Bus system (Hoval CAN bus)		
• Capacity		Max. 4 control modules/3 control modules + 1 gateway
• Bus supply		yes
• Bus line		4-wire bus
• Bus length max twisted, shielded	m	100 (greater distances possible with engineering of additional measures)
• Line cross-section	mm ²	0.5
• Cable type (recommended)		JY-(ST) 2 x 2 x 0.8
Other bus interfaces		Internal unit bus (master)
Miscellaneous		
• Spring reserve		approx. 10 years, battery buffered
• Type of protection		IP 20
• Protection class		I – EN 60730

Electrical connection

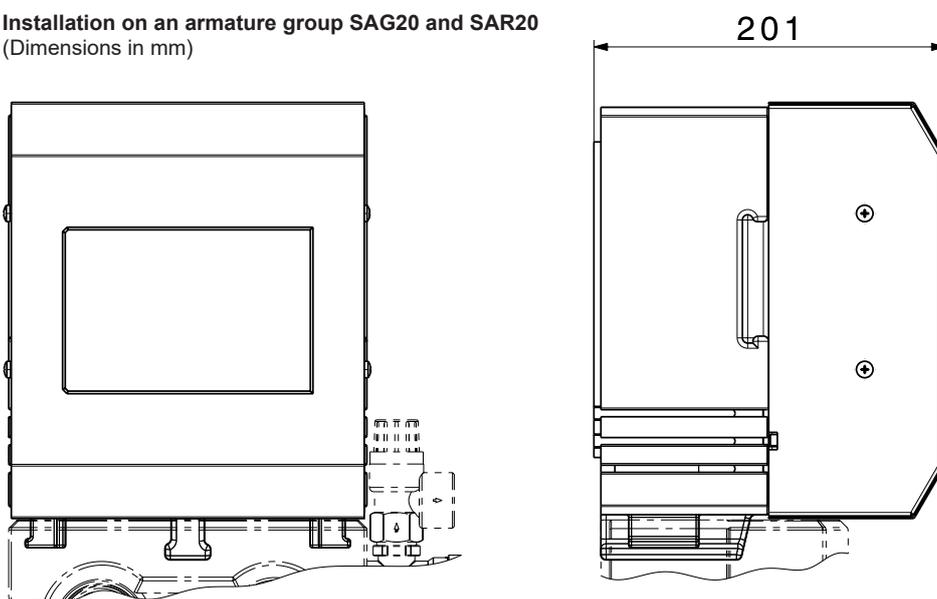
TopTronic® E solar module



Solar controller set WM (wall installation)
Solar controller set AG (armature group)
 (Dimensions in mm)



Installation on an armature group SAG20 and SAR20
 (Dimensions in mm)

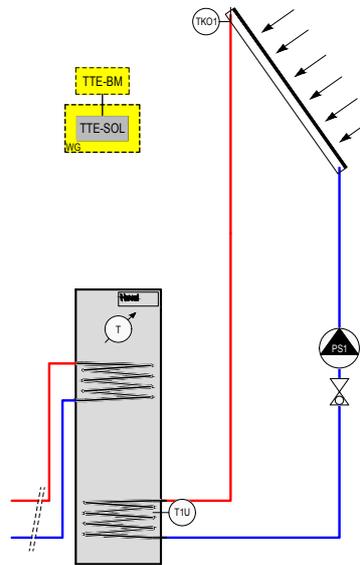


Heat quantity balancing for solar systems

Variant 1 (305) Energy balancing without installation of a heat meter

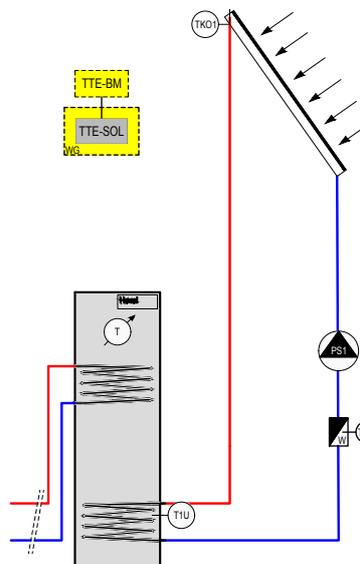
TopTronic® E solar module offers the opportunity of calculating and displaying the solar yield by storing a fixed flow rate of value. Also, when a speed-controlled circulating pump is used, there is no need for additional components in order to calculate the solar yield. **Variant 2** can be used for more accurate balancing.

- Application: energy yield calculation collector circuit
- Flow: constant or speed-controlled - balancing valve TN necessary
- Flow sensor: collector sensor (TKO1)
- Return sensor: calorifier sensor (T1U)



Variant 2 (310) Energy balancing with heat meter

- Application: energy yield calculation collector circuit
- Flow: FlowRotor kit (FlowRotor already installed in solar armature group SAG/SAR FR)
- Flow sensor: collector sensor (TKO1)
- Return sensor: installed in FlowRotor (TKR)



1 Use of solar energy

The use of the solar energy reduces the pollutant emissions with the production of low-temperature heat and preserves thereby the environment.

With the use of solar energy no fossil sources are being burned, thus valuable raw materials are being preserved at negligible annual operating cost.

Per year up to 1200 kW/h of sun exposure energy is available for water heating, swimming pool heating and low-temperature heating per square metre of collector surface.

Professionally dimensioned and implemented solar plants prepare for many decades a large part of the yearly warm water with a temperature of 60 °C and beyond.

By the use of high-quality materials the life expectancy of a solar plant amounts to several decades.

The use of solar energy is today a highly developed technology, which:

- is absolutely safe and causes no damage
- does not decrease the dependence on valuable and regenerable, fossil sources of energy
- can be used without impairment of the environment
- is available free of charge, without the danger of economic price influence or manipulation
- can be used decentralised, whereby expensive distribution and control devices can be cancelled
- is available continuously for all time

2 Planning and dimensioning references for solar plants

Information for new buildings

Solar plants can be integrated in many cases optimally in the roof. Certain difficulties with the accommodation of the collectors due to the prescribed roof pitch resp. the roof ridge direction can occur. Therefore it is already advisable, when planning of the new building to keep certain guidelines which favour the solar energy use:

1. During the building of the house it is to be respected unimpaired exposition to sun of the roof area within the range of southeast to southwest. The chimney and the roof systems should be accommodated in the northern part of the house if possible.
2. For the in-roof installation of the collectors in a south lateral roof area (or a part of the same), the angle of inclination should amount $> 22^\circ$ for sheet metal frames on site or $> 25^\circ$ for sheet metal frames from Hoval. Otherwise the collectors must be raised against the roof pitch.
3. If an installation of the collector plant on the roof should prove as technically unfavourable, it can be installed also on the ground.
4. For the solar connection pipes either a shaft is to be planned, or the tubes can be installed first between the assembly place of the collectors up to the storage tank.

5. The water heating takes place separately from the boiler for example in the solar water heater. The boiler can be warmed up both by the solar plant and with the conventional heating. During correct planning of the solar plant the heating system for water heating can remain out of operation in the summer half-year.
6. For the part-solar room heating different combinations are possible.
7. Warm water connections for washing machine, dishwasher etc. are recommended.
8. To increase the utilisation of the valuable heating energy generally applies:
 - Very well thermally insulated buildings
 - Energy-fair architecture for passive use of solar energy
 - Design of the hot water heating on a low flow temperature
 - Modern heating regulation and system engineering
9. The collector angle is freely selectable between 22° and 90° .

The most important components of a solar plant are an efficient long-term collector, the solar armature group, the solar regulation and the solar storage tank with the integrated heat exchanger, which is co-ordinated with the size of the collector surface and the water heater volume. With larger plants an external plate-type heat exchanger should be used.

A professional assembly is a requirement for the full efficiency of the solar plant.

1 Collectors

The collector surface should be arranged to south. (Angles of inclination of the collectors see dimensioning guidelines). The collector surface should not stand in the shadow at any time of day.

2 Fastening parts

The minimum installation angle of the collectors Hoval UltraSol® 2 is 22°; if using Hoval sheet metal edgings 25°.

Depending on the assembly place of the collectors, Hoval supplies fastening parts and assembly kits for the different mounting types:

- in-roof assembly with integrated sheet metal frame
- on-roof assembly parallel to the roof pitch
- on-roof assembly with raised angle of inclination
- flat roof assembly and assembly at the soil with different angles of inclination

3 Connection tubes

The solar circuit consists of the tubes for the heat transfer medium, usually copper tubes including thermal insulation, which are laid from the collector to the water heater, and of sensor tubes for the difference temperature control and the frost-protected heat distribution medium. As an alternative to the copper tubes, pre-fabricated solar pipes with thermal insulation and integrated sensor leads and made from corrugated stainless steel tubing are finding increasing use.

The advantage of these connection pipes lies in easier and quicker routing.

4 Solar armature group

The solar armature group provides for the forced circulation of the heat distribution medium in the solar circuit and contains all fill, lock off, safety and indicator armatures (manometer, thermometer).

With the operation of the solar storage tank or with multi-circuit plants the solar armature group SAG will be used, which is mountable onto the wall.

In addition this thermally insulated, assembly-finished unit offers the possibility to connect a diaphragm pressure expansion tank.

The performance of the circulating pump should be examined (dependent on collector surface, pipework length and flow resistances).

5 Solar calorifier and energy storage tank

With conventional solar plants for water heating and room heating support the solar water heaters within the lower range are heated by a heating element on the inside or - with larger collector surfaces - by an external plate-type heat exchanger.

The Hoval solar multi-storage tank is equipped with largely dimensioned fixed inserted heating elements on the inside (MultiVal ERR, MultiVal ESRR, MultiVal CRR, MultiVal CSRR).

It goes without saying that all solar calorifiers also offer the possibility of heating a part of the storage tank volume by conventional heat generators, and can be additionally equipped with electric heating sets.

6 Solar control

A non-toxic, frost-protected heat transfer fluid is heated in the collectors. As soon as the temperature at the collector sensor is higher than the temperature measured in the lower part of the solar storage tank by the set temperature difference, the circulating pump is switched on via the solar control system. Thereby the heat transfer medium heated up in the collectors is transported into the heat exchanger, which is in the water heater, delivers the warmth at the service water or the heating water and flows cooled down back into the collectors.

This circuit is only interrupted if the temperature difference between collector and memory sensors is again smaller than the adjusted difference temperature.

Depending upon plant conception and the number of the solar energy customers who can be warmed up one-circuit resp. multi-circuit regulations are necessarily.

For the description of the quality of solar collectors and for the comparison of their efficiency some collector characteristic data worked satisfactorily. These characteristic data is determined after standardised testing methods by independent testing institutes.

1 Conversion factor

(η_0 , unit %)

is the maximum collector efficiency in per cent. It is reached if the average collector temperature is equal to the ambient temperature.

2 Heat loss coefficient

(U-value, unit W/m²K)

describes the average heat loss of the collector related to the entrance surface and the temperature difference between collector work temperature (= average collector temperature) and ambient temperature.

3 Collector characteristic

The collector characteristic shows the dependence of the collector efficiency on the temperature difference between collector work temperature and ambient temperature and the sun exposure. The process of the collector characteristic is determined by the building method of the collector and the operating conditions.

Thus affect the light permeability of the collector vitrification, the kind of the absorber coating, the thermal insulation and the radiation and convection losses the process.

A collector with a high conversion factor, small heat loss coefficient and flat characteristic is considered as energetically particularly favourably.

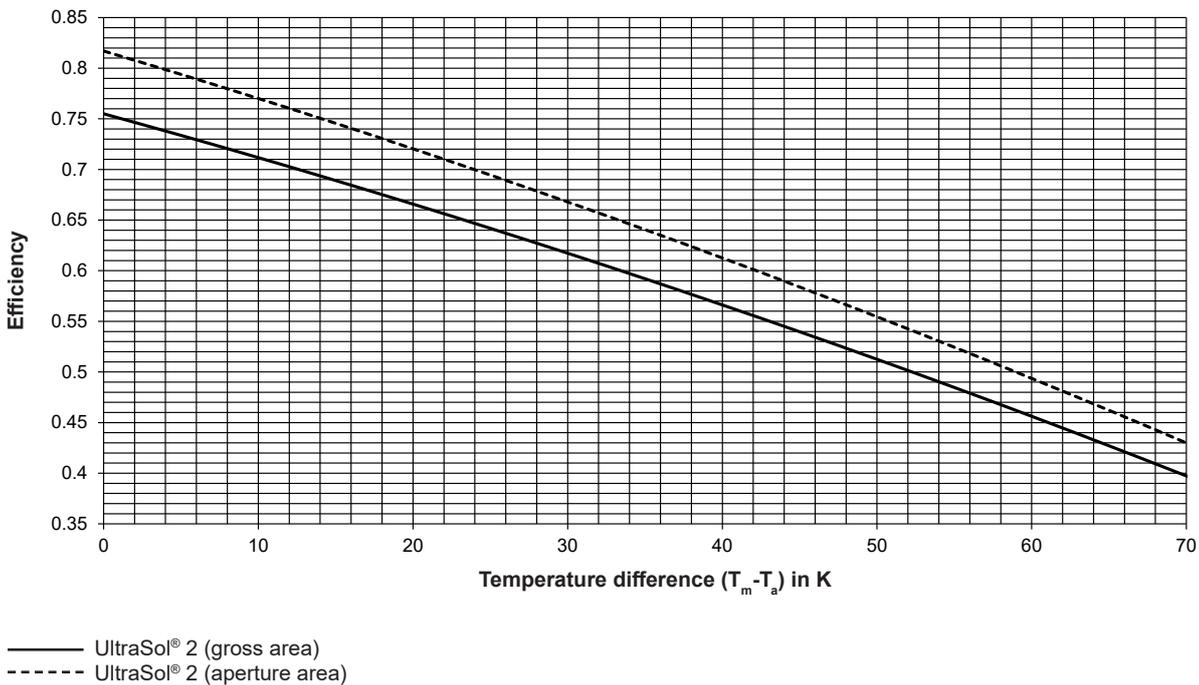
For the comparison of collectors the effective absorber surface (collector effective area) of a collector is in addition, just as important, since by it the total quantity of the irradiation energy taken up by the collector is determined.

4 Collector testing

The quality and energy efficiency of solar collectors is determined by standardised test procedures of independent institutions, e.g. according to EN 12975. Based upon this testing the European quality label for solar collectors "Solar KEYMARK" is being issued.

Hoval solar collectors are quality and performance-tested by different inspecting authorities and are labelled with Solar KEYMARK. As a result, they meet the highest quality standards.

Efficiency characteristic curve UltraSol® 2



T_m = average collector temperature
T_a = ambient temperature

Valid for flat collectors under the following conditions

1. Average sun exposure about 1200 kWh per square meters and year, related to the horizontal irradiation surface and the Central European climate conditions.
2. Sunshine on the collector surface more than 90 %, no shade
3. Collector angle of inclination depending upon type of use and period of use:
 - Open-air swimming pool from May to September 25-35°
 - Service water and indoor swimming pool 30-50°
 - Service water all year round 35-55°
 - Service water and additional heating 40-60°
4. Deviation of the collector surface from the south < 35°. In the case of deviations from 35 up to 45° of the south direction an enlargement of the collector surface of approx. 20 % is necessary. Collector arrangements with deviations greater than 45° from the south direction are not recommended.
5. As far as possible the entire collector surface should be arranged in an orientation. An allocation on differently oriented collector fields is not recommended.

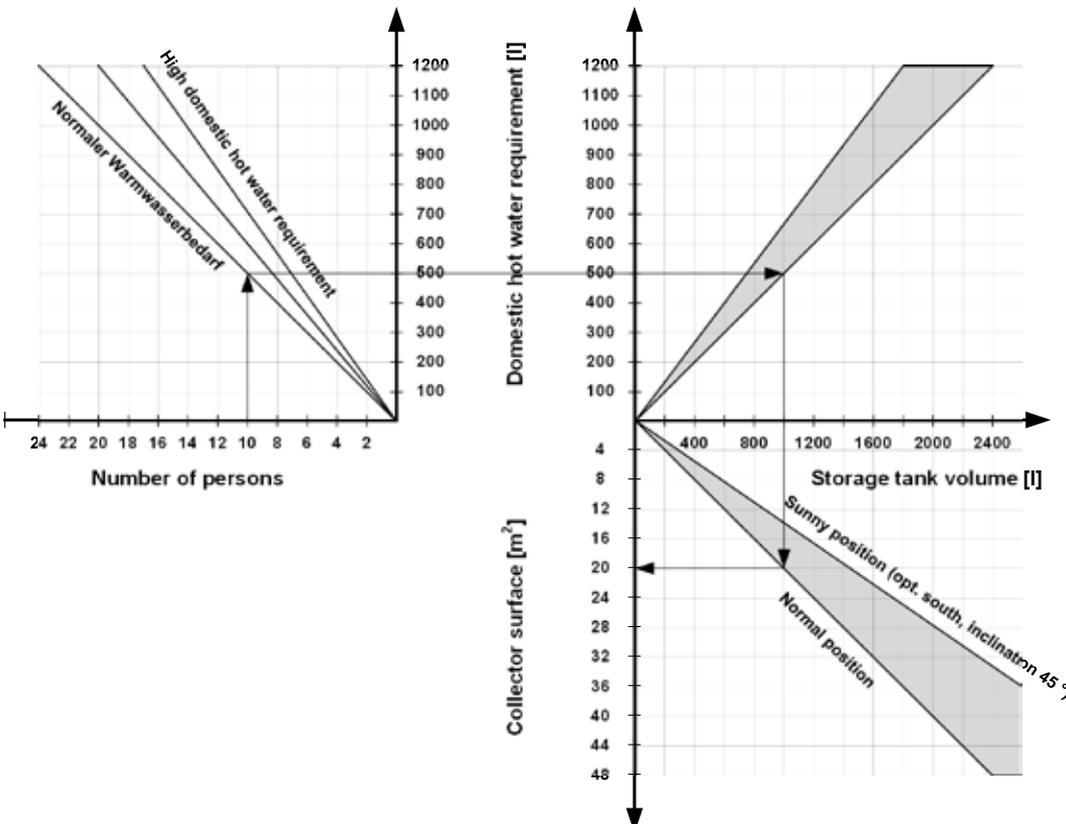
1 Water heating:

For the water heating with standard solar plants (flat collector HighFlow) approx. 1.5 m² collector surface and 50 to 85 litres storage volume are necessary per person.

Examples of water heating:

2-3 persons, collector surface up to 4 m ²	300 l storage tank
3-4 persons, collector surface up to 6 m ²	300 l storage tank
4-6 persons, collector surface up to 8 m ²	500 l storage tank
6-8 persons, collector surface up to 10 m ²	500 l storage tank
8-10 persons, collector surface up to 12 m ²	500 l storage tank
10-14 persons, collector surface up to 16 m ²	800 l storage tank
14-18 persons, collector surface up to 20 m ²	1000 l storage tank
18-24 persons, collector surface up to 24 m ²	2 x 800 l storage tank

Dimensioning diagram solar collector surface for water heating



Interpretation diagram for the solar collector surface with standard solar plants for water heating.

2 Room heating:

Particularly in the transitional period and in connection with low-temperature heating systems (wall or under-floor heating) solar collectors can be used depending upon irradiation with considerable success.

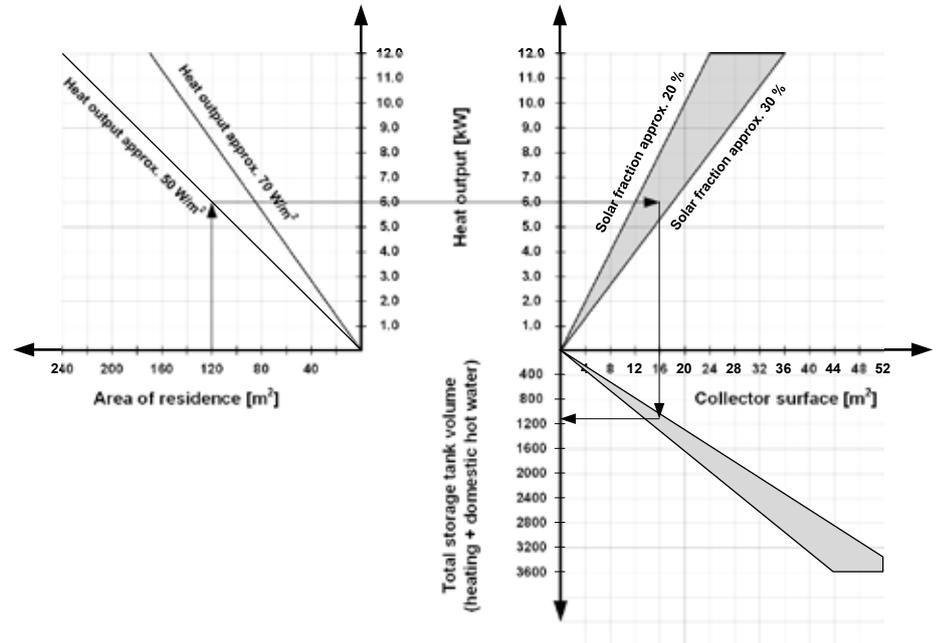
As approximate value 1.5-2 m² collector surface are to be planned additionally for water heating per 10 m² living space, respectively 15-20 % of the surface which has to be heated.

In progressive low-energy buildings, the heating system can be supported even with smaller collector surfaces (from 10 % of the heated area).

3 Swimming pool heating:

Swimming pools may be warmed up with copper collectors only over a suitable heat exchanger (dual-circuit systems). As approximate value at least ⅓ of the basin surface as collector surface are to be planned.

Dimensioning diagram solar collector surface for water heating and heating support



Solar collectors

Solar collectors are used to generate heat and utilise the total momentary radiation. The orientation and slope of the solar collectors have a significant influence on the effectivity of the solar plant and must be checked for each individual system.

Location

- *Sloping roof*
A good solution. Orientation, angle of inclination and shade must be checked. Collector field designs are available for on-roof and in-roof assembly.
- *Flat roof*
Very good solution allowing optimum selection of orientation and angle of inclination for the solar collectors. Shade must be checked. Solar collectors can often be erected in two or more rows.
- *Building facade/balcony*
Poor results. An angle of inclination of 15-20° for the collectors already ensures much better utilisation. Some wall installation sets with several angles of inclination are available. We highly recommend an on-site supporting structure for the collector assembly with corresponding angles of inclination.

Approximate values

Standard values for collector surfaces

Single- and two-family homes

	Collector surface per person	per MWh/a *
Hot water	1-1.25	-
Hot water+	-	0.6-1
Heating support		

Multiple dwelling units

	Collector surface per person
Hot water	0.8
Preheating	0.5

* Annual heat demand for hot water and heating

Allowances for the collector surface

Hot water

Orientation	Slope degrees	Flat collector %
	0-22°	not permissible
South	22-25°	approx. 10
South-west	25-60°	0
South-east	60-75°	approx. 10
	75-90°	30-50
	0-22°	not permissible
West	22-30°	15-20
East	30-50°	0
	50-75°	30-50
	75-90°	50-80

Hot water and heating support

Orientation	Slope degrees	Flat collector %
	0-22°	not permissible
South	22-25°	20-30
South-west	25-60°	10
South-east	60-75°	0
	75-90°	20-40
	0-22°	not permissible
West	22-30°	25-35
East	30-50°	35-45
	50-75°	45-60
	75-90°	60-100

Heating outdoor swimming pools

Orientation	Slope degrees	Flat collector %
South	0-22°	5
	22-40°	0
	40-60°	15
South-west	0-22°	15
South-east	22-40°	0
	40-60°	20
West	0-22°	10
East	22-40°	25
	40-60°	40

Shade

(proportion of shade max. 25 %)

Period	Allowance
All-year	20 %
Winter and between seasons	10 %
November to January	0 %

Approximate values for collector yields

Annual yield per m² useful collector surface, dependent on location, system design and user characteristics.

Hot water

Utilisation standard	kWh/m ² a
High degree of coverage	300-450
Average degree of coverage	400-550
Preheating	450-650

Hot water and heating support

Design	kWh/m ² a
Generous dimensions	150-250
Average dimensions	200-300
Tight dimensions	250-500

In mountain regions, the solar collectors should not remain covered with snow for long periods of time. They should be positioned in such a way that the snow slides off (min. slope 45°, no snow fence at the bottom).

Heating outdoor swimming pools

Flat collector type	Yield kWh/m ² a
unglazed, SP absorber	280-330
glazed	260-320

Heat exchangers

The solar circuit heat exchangers should be designed for an average temperature difference (ΔT_m) of approx. 5-15 K at max. collector output (700 W/m²). Up to approx. 30 m² collector surface, internal heat exchanger surfaces are usually used. Above this, an external heat exchanger (plate exchanger) is recommended. Calorifiers should be designed for 700 W/m² collector output and an average temperature difference of 5-10 K. Note that there is a danger of calcification. For this reason, the plate exchanger should rather be used for heating the swimming pool or for charging heating water tanks.

Approximate values for internal heat exchangers

- Plain-tube exchangers: 0.15-0.25 m² per m² collector surface
- Finned-tube exchangers 0.3-0.5 m² per m² collector surface

Influence of ΔT_m selection: Effect on the efficiency of the system

ΔT_m	5 K	10 K	15 K	20 K
Change	+3.5 %	0	-3.5 %	-7 %

Solar storage tanks

The heat supplied by the solar collectors is transferred in the solar storage. The solar storage bridges the time gap between heat recovery and consumption. The solar storage tank incl. connections and flanges should be well insulated and *all connection pipes should be connected with a siphon.*

Check the max. permissible operating temperature and operating pressure of the solar storage tank.

Approximate values
Standard values for the tank size

Hot water

	Volume dm ³
Single- and two-family houses	85/person
Volumetric content for additional heating (electric)	acc. to daily demand
Multi-family houses	80/person
Volumetric content for solar heating *	40/m ² collector surface
additional heating electric boiler	acc. to daily demand 15-60/person

Hot water and heating support for single- and two-family houses

	Volume per m ² collector surface
Solar heating *	40-60
Additional heating	40-60

* Free "solar volume" for the storage of solar energy

Diaphragm pressure expansion tank

The dimensions of the diaphragm pressure expansion tank must be selected taking into account the total content of the collectors (in the event of evaporation).

Observe the following during selection:

- Max. operating temperature (provide pre-tank where necessary)
- Check the pretension of the selected diaphragm pressure expansion tank against system-specific data.

Solar circuit pipes

Copper, iron or stainless steel pipes can be used for the solar circuit. The pipe runs should be kept short, in particular the flow pipe for the collector field (line from the collector field to the consumer load). Pipes must be routed and insulated professionally.

The thermal insulation should be resistant to temperatures of at least 130 °C. For recommended insulation thickness and pipe cross-sections: see Solar collectors.

Heat transfer liquid

As a rule, a frost protection agent on polypropylene basis is used as frost protection in the solar circuit. The concentration should be selected according to the climate zone and system-specific data. A frost protection percentage of 40 % is usually sufficient. Percentages of over 50 % frost protection should be avoided.

Example: approx. -20 °C outside temperature (glycol content 40 %). *The water and glycol must be mixed before introducing the mixture into the system.*

Circulating pumps, instruments, armatures

Check the max. permissible operating temperature for the selected products.

Overheating protection

High temperatures and possible formation of vapour in the solar circuit can never be completely ruled out. (The sun supplies heat even when this heat cannot be used directly.)

Causes:

- Systems with widely fluctuating consumption
- Power failure or defective system components

For this reason, we recommend the inclusion of an overheating concept before realisation of the system. The minimum requirements here are:

- regulatory measures
- thermal discharge safety device
- selection of the correct diaphragm pressure expansion tank
- selection of the appropriate frost protection agent

Flushing, filling and venting

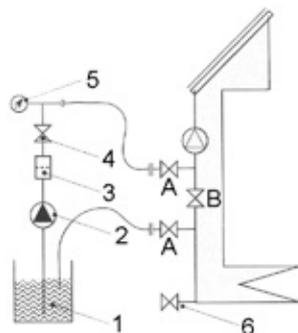
The system may only be filled and pressure testing carried out when the sun is not shining on the collector field.

Flushing of the system is extremely IMPORTANT and must be carried out with due care, for preference with the prepared heat transfer liquid.

Dirt particles in the system cause malfunctions. Use filters!

The system may only be filled if it can be put into operation at the same time. A jet pump should be used to fill the system.

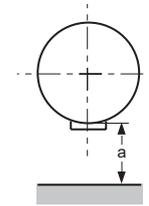
The system should be completely installed, filled and connected on the consumer side, including the solar storage tank, and the heat transfer fluid should be mixed and ready.



- 1 Tank
- 2 Jet pump
- 3 Filter
- 4 Ball valves
- 5 Pressure gauge
- 6 Drain
- A Open
- B Closed

Necessary space

- The inspection opening has to be well accessible.
- Distance to the wall for the installation and removal of the electric heating element (a):

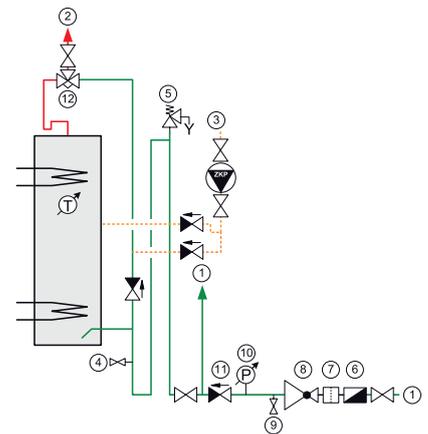


Calorifier	dm ³	a
MultiVal ERR	300-500 l	≥ 600
MultiVal ESRR	800-1000 l	≥ 950
MultiVal CRR	300-540 l	≥ 600
MultiVal CSRR	800-2000 l	≥ 950
EnerVal	500-1500 l	≥ 950

(laterally left or right distance to wall for mounting of casing) ≥ 700

Plumbing

- For electrical heating a hot water distribution system without circulation must be planned if possible.
- The hot water pipe must be insulated and installed with a siphon (minimum ≥ 200 mm).
- Maximum safety adjustment: 1 bar less than the maximum operating pressure
- Caution! When only small amounts of hot water are tapped, higher hot water temperatures can occur. (Depending on comfort requirements, provide suitable measures, e.g. thermomixer etc.)

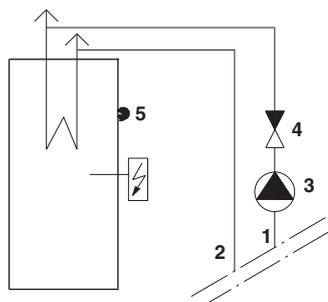


- 1 Cold water
- 2 Hot water
- 3 Circulation
- 4 Drain
- 5 Safety valve
- 6 Pressure reduction valve
- 7 Testing device
- 8 Return flow inhibitor
- 9 Connection for manometer
- 10 Thermostatic blender for water

Heating assembly

(Recharging with boiler)

- Flow and return lines must be connected in such a way that no flow reversal and single-pipe gravity circulation can occur with the charging pump switched off and electric heating switched on (see drawing).
- Expansion of heating water must always be ensured (also during electric charging).
- Install air vent at the top point of the heating water pipe.



- 1 Flow
- 2 Return
- 3 Venting charging pump
- 4 Non-return valve
- 5 Temperature regulator

Commissioning

- The system must be created, the heating and plumbing installation carried out, the system filled, vented and the electrical connections established in accordance with the design documentation and assembly specifications for the system components supplied.
- At the time of commissioning, the design values must be known and the building owner or the person responsible for operation present for instruction.
- Registration should be carried out in good time before the planned date of commissioning.

Maintenance

The following inspections must be planned for maintenance of the system:

Inspection	Type
<i>User</i>	
Condition of system	Visual inspection
Circulating pump	periodical
Pressure	

The thermal solar plant must be checked regularly in order to ensure the operational safety and the efficiency as well as the high durability in the long term. Inspection should be carried out annually and maintenance every 2 years. The completion of a maintenance contract is recommended for all thermal solar plants.

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.

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

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.