

IsoTop

Mounting instructions



CONTENTS

PAGE

1	General	2
2	Mounting of the supports	5
3	Rack mounting	7
4	Module mounting	10
5	Tolerances	11
6	Lightning protection and potential equalization	12
7	Warnings	12

General information

The IsoTop system is custom-designed to its designated location; a structural analysis is prepared to determine the profile cross-section, taking into account the local loads and specific regional conditions. Example structural analysis Dr. Zapfe GmbH:



**Gewerbegebiet B15
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**Planungsunterlagen für das Tragsystem zur
Aufnahme von Solarmodulen IS1V - 20**

Projekt: Mustermann GmbH

Modultyp: 1600 x 800 mm

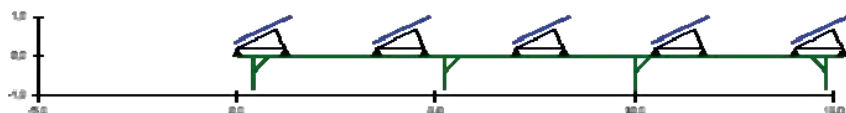
Dr. Zapfe GmbH
Ingenieurbüro für konstruktiven Ingenieurbau und Solartechnik



Zusammenstellung der Lastgrößen

Bezeichnungen und Koordinaten				Windlast oben			Windlast unten			
	x ₁ m	x ₂ m	x _n m	LK 1 kN	LK 2 kN	LK 3 kN	LK 1 kN	LK 2 kN	LK 3 kN	
Äussere Belastung										
A	0,00	4,70	18,80	12,01	9,41	-5,99	14,14	11,69	-8,62	
B	1,20	5,90	20,00	11,61	7,53	-1,79	9,48	8,32	0,84	
Summe vertikal				118,09	84,69	-38,86	118,09	100,00	-38,86	
C	0,00	4,70	18,80	-1,60	-2,67	-4,28	-1,60	-2,67	-4,28	
Auflagerkräfte am statisch bestimmten Grundsystem kN										
A _v	0,40	aus Vertikallasten		59,13	42,74	-20,31	60,02	50,70	-21,40	
B _v	14,80			58,96	41,95	-18,56	58,08	49,30	-17,46	
A _h	0,40	aus Horizontallasten		0,47	0,79	1,26	0,47	0,79	1,26	
B _h	14,80			-0,47	-0,79	-1,26	-0,47	-0,79	-1,26	
A _{ges}	0,40	vertikal		59,60	43,53	-19,04	60,49	51,49	-20,14	
B _{ges}	14,80			58,49	41,17	-19,82	57,60	48,51	-18,72	
statisch unbestimmte Auflagerkräfte kN										
A				-25,49	-19,12	7,97	-26,54	-22,72	9,26	
X ₁				-34,09	-24,26	10,75	-33,59	-28,52	10,14	
X ₂				-34,17	-24,70	11,73	-34,68	-29,30	12,36	
X ₃				0,00	0,00	0,00	0,00	0,00	0,00	
B				-24,35	-16,61	8,42	-23,29	-19,47	7,11	
Horizontalkräfte C (Innenstütze)				2,67	4,46	7,13	2,67	4,46	7,13	
Aussteifungsverbände/Diagonalen kN										
N	Rand				4,02	6,70	10,72	4,02	6,70	10,72
N	innen				8,04	13,40	21,43	8,04	13,40	21,43
Schnittkräfte in den Stützen kNm/kN										
M	Rand				0,60	1,00	1,60	0,60	1,00	1,60
M	innen				1,20	2,01	3,21	1,20	2,01	3,21
N	Rand				2,84	4,74	7,58	2,84	4,74	7,58
N	innen				5,68	9,47	15,16	5,68	9,47	15,16
maßgebende Normalkraft				49,32	30,38	21,20	49,83	34,98	21,83	
Spannungsnachweis Stütze $\sigma_x =$				10,18	12,11	16,81	10,23	12,54	16,87	

Systemdarstellung

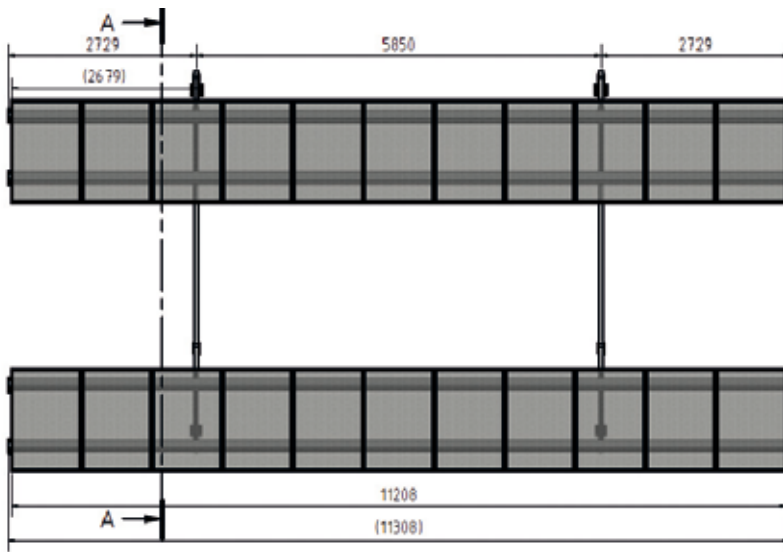


Planning

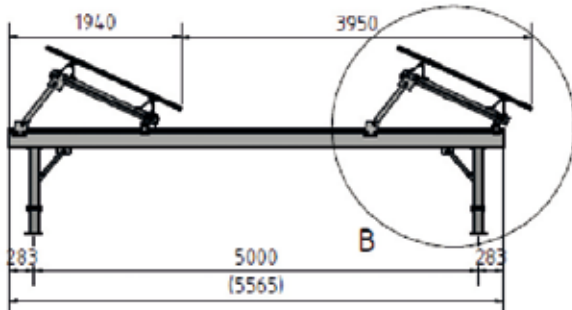
Subsequent to an on-site inspection and approval of draft design drawing, a final mounting schematic containing all required dimensions is drawn up for every IsoTop project, based on the preliminary plan. The system components are to be positioned and assembled according to this diagram. Any deviation in the assembly mounting has a direct effect on the system statics!

The examples presented in this instruction serve solely as a guide for your own project plan.

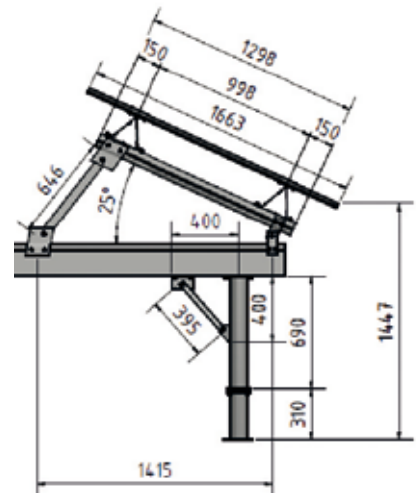
Example schematic:



A-A (1 : 50)



B (1 : 25)



Support designs

The various support designs are distinguished as follows:



Warm roof support with standard base plate slotted hole

Thermal separation is built into the insulation layer (min. 60 mm) to prevent a thermal bridge between the girder and the PV plant



Warm roof support with a special base plate

dto. Here the base plate is customized to the individual girder structure



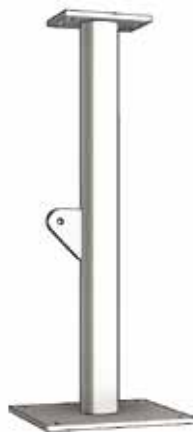
Warm roof support with TR trapezoidal shoe

The deployment of trapezoidal shoe base plates negates the need to open the metal sheet (substructure), thus avoiding the soiling of the inner roof cavity



Cold roof support with standard base plate

With non-insulated roofs or roofs with insufficient insulation height (min. height 60 mm) thermal separation is not integrated



Cold roof support with special base plate

dto. Here the base plate is customized to the individual girder structure



Cold roof support with TR trapezoidal shoe

The deployment of trapezoidal shoe base plates negates the need to open the metal sheet (substructure), thus avoiding the soiling of the inner roof cavity

2 Mounting of supports

1 Mark positions

c.f. mounting schematic. Ensure correct distances. The exact fix-point on the roof is to be defined by the customer, this is not stipulated in the mounting diagram!



Select point of reference on the roof. Define the positions on the roof for the supports.

2 Open up the roof

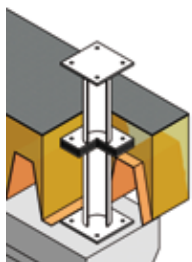
Slice open the roof membrane to approx. 40x40 cm at the marked position and remove the hard / soft insulation. For the support design Standard, the trapezoidal sheet must also be cut at the standing rib. The opening must be sufficiently large to allow the base plate of the support to fit through.



The roof covering (trapezoidal sheet) must not be opened when mounting with the Schletter TR trapezoidal shoe.



The thermal separation must be securely bolted together and must sit at the insulation layer to prevent a thermal bridge to the roof.



Please use M10x45 bolts and flange nuts



Note

Sealing is possible on trapezoidal sheet metal, but in coordination with a specialist, in order to ensure long-term permeability.



3 Bolt in the supports

Care should be taken here that the bolts for fastening the supports are compatible with the beams and comply with the defined structural loads. With concrete- or reinforced concrete beams, a compatible stud bolt or adhesive anchor should be selected. With wooden beams, compatible wood screws are to be used according to the current DIN. With steel beams, an appropriate grade of screws or approved drilling screws are to be used. Please contact the Schletter Service team for advice.



4 Replace the insulation

Once the supports are bolted in place the insulation can be replaced. It should be ensured that no large holes are present in the walk-on insulation. Risk of falling through!



5 Seal all holes

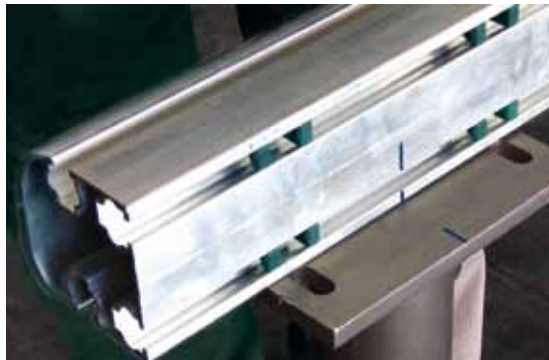
These can be welded reliably and cost-effectively by the roofer. The respective warranties for this work are thus kept completely separate. The spray-water protection must sit at least 15 cm above the roof covering. When mounting supports with struts, the connecting lugs must sit with min. 180 mm of the underside to the foil, to guarantee perfect adhesion.



3 Rack mounting

1 Mount continuous beams BF

Arrange click components and square nuts M10 at the appropriate distances (as outlined in the mounting diagram), mount the continuous beam on the supports and secure using bolts M10x25.



Create a joint between continuous beams. With the continuous beam BF design, the partitions defined in the mounting drawing must be observed. 2 drilling screws are used per profile to connect beams. A slide connector must be assembled with continuous beams of > 20 m.



2 Mount struts

Secure T-piece in the same way with the Klick system and M10x25 bolts. Secure struts (in each case 2 x U-profiles) between support and T-piece using M10x25 or M10x35 bolts with M10 nuts with locking teeth.



Please note:

Not all IsoTop system components are delivered pre-assembled, these must be assembled on the construction site.

3 Mount hinges

Use Klicksystem and screws M10x25 to mount to the continuous beam BF according to specifications.



4 Mount BF girders

Fasten hinges to the BF girder in the same manner. Connect the front hinge (tip) with screws M10x25 or M10x35 and M10 nuts with locking teeth.



Please note:

Hinge connectors are asymmetric. It is therefore critical that these are bolted together correctly.



5 Position hinge connector on the girder

Position hinge connector correctly on the girder, arrange the girder on continuous beam and bolt together using M10x25 screws and M10 nuts with locking teeth (see mounting plan).



6 Mount struts

Bolt square aluminium struts 55x55mm or 55x75mm securely between hinge connectors with M12x80 bolts and M12 nuts with locking teeth. The position of the struts dictates the elevation angle of the plant. Incorrect positioning can result in a loss of yield.



7 Mount S-Purlins

Fasten the module-bearing beam, position the S-Purlins on the girders BF, guide these into the correct positions and bolt together using M10x25 bolts, mounting claws, M10 click components with square nuts M10 run along the M10 click-groove of the girder.



8 Mount connector

Position the connector for the S-Purlins. Connectors must be inserted at pre-defined joints due to the large mounting spans. Bolt each purlin joint with 2 drilling screws per profile. A selection is made between fixed and slide connectors - please ensure that no module is mounted above a slide connector! A slide connector **must** be assembled with continuous beams of > 20 m.



4 Module mounting

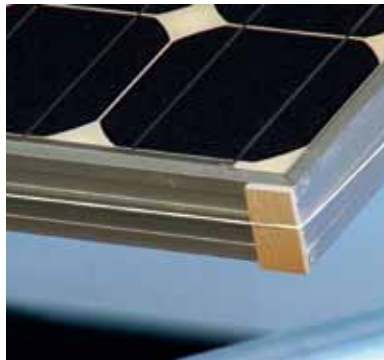
Vertical

Mount the modules to the S-purlins and fasten with end- and middle clamps. c.f. Mounting plan.

Horizontal

Modules are aligned in a horizontal arrangement, clamps are not mounted transversely to the profile but along the length.

C.f. General mounting of Schletter modules



Further information relating to our IsoTop system can be found on our website: www.schletter.eu under Downloads in the Solar section.



5 Tolerances

A tightening torque of strength category 6.8 is to be used with high-grade steel screws (V2A, V4A).

Gewinde	Reibungs- zahl μ_{ges} s.T.035	Maximale Vorspannkraft F_M max. [N]							Maximales Anziehdrehmoment M_A max. [Ncm]							Umrech- nungs- faktor X
		Festigkeitsklassen nach ISO 898 / 1							Festigkeitsklassen nach ISO 898 / 1							
		3.6	4.6	5.6 (4.8)	6.8	8.8	10.9	12.9	3.6	4.6	5.6 (4.8)	6.8	8.8	10.9	12.9	
M 1,6	0,10	176	235	294	470	627	882	1058	4,2	5,7	7,1	11,3	15,1	21,2	25,5	0,024
	0,12	171	228	285	455	607	854	1025	4,7	6,3	7,9	12,6	16,9	23,7	28,5	0,028
	0,14	165	220	275	441	588	826	992	5,2	6,9	8,7	13,9	18,5	26	31,2	0,032
M 2	0,10	292	390	487	779	1039	1461	1754	9	11,9	14,9	23,8	31,7	44,5	53,5	0,031
	0,12	283	378	472	756	1008	1417	1701	10	13,3	16,7	26,7	35,6	50	60	0,035
	0,14	274	366	457	732	976	1373	1647	11	14,7	18,4	29,4	39,2	55	66	0,040
M 2,5	0,10	485	647	809	1294	1725	2426	2911	18	24	30	49	65	91	109	0,037
	0,12	471	628	785	1257	1676	2356	2828	21	27	34	55	73	103	123	0,044
	0,14	457	609	762	1219	1625	2285	2742	23	30	38	60	81	113	136	0,050
M 3	0,10	726	968	1210	1938	2582	3631	4357	32	42	53	84	112	158	190	0,044
	0,12	706	941	1177	1883	2510	3530	4236	36	48	60	95	127	179	214	0,051
	0,14	685	914	1142	1827	2436	3426	4111	40	53	66	105	141	198	237	0,058
		Maximale Vorspannkraft F_M max. [kN]							Maximales Anziehdrehmoment M_A max. [Nm]							
M 4	0,10	1,26	1,68	2,10	3,36	4,5	6,7	7,8	0,73	0,9	1,2	1,9	2,6	3,9	4,5	0,58
	0,12	1,22	1,63	2,04	3,26	4,4	6,5	7,6	0,82	1,0	1,3	2,1	3,0	4,6	5,1	0,67
	0,14	1,19	1,58	1,98	3,17	4,3	6,3	7,4	0,91	1,2	1,5	2,4	3,3	4,8	5,6	0,76
M 5	0,10	2,06	2,74	3,43	5,48	7,4	10,8	12,7	1,4	1,9	2,4	3,8	5,2	7,6	8,9	0,70
	0,12	2,00	2,67	3,33	5,33	7,2	10,6	12,4	1,6	2,2	2,7	4,3	5,9	8,6	10,0	0,81
	0,14	1,94	2,59	3,23	5,18	7,0	10,3	12,0	1,8	2,4	3,0	4,8	6,5	9,5	11,2	0,93
M 6	0,10	2,90	3,87	4,84	7,74	10,4	15,3	17,9	2,5	3,3	4,1	6,6	9,0	13,2	15,4	0,86
	0,12	2,82	3,76	4,71	7,53	10,2	14,9	17,5	2,8	3,7	4,7	7,5	10,1	14,9	17,4	0,99
	0,14	2,74	3,65	4,57	7,31	9,9	14,5	17,0	3,1	4,1	5,2	8,3	11,3	16,5	19,3	1,14
M 8	0,10	5,3	7,1	8,8	14,2	19,1	28,0	32,8	6,0	8,0	10,0	16,1	21,6	31,8	37,2	1,13
	0,12	5,15	6,9	8,6	13,8	18,6	27,3	32,0	6,8	9,1	11,3	18,2	24,6	36,1	42,2	1,32
	0,14	5,0	6,7	8,3	13,4	18,1	26,6	31,1	7,5	10,1	12,6	20,1	27,3	40,1	46,9	1,51
M 10	0,10	8,4	11,3	14,1	22,5	30,3	44,5	52,1	12	16,1	20,1	32,2	43	63	73	1,42
	0,12	8,2	11,0	13,7	21,9	29,6	43,4	50,8	13,7	18,3	22,9	36,5	48	71	83	1,65
	0,14	8,0	10,7	13,3	21,3	28,8	42,2	49,4	15,2	20,3	25,3	40,6	54	79	93	1,89
M 12	0,10	12,3	16,4	20,5	32,8	44,1	64,8	75,9	20	27	34	55	73	108	126	1,65
	0,12	12,0	16,0	20,0	32,0	43,0	63,2	74,0	23	31	39	62	84	123	144	1,94
	0,14	11,6	15,5	19,4	31,1	41,8	61,5	72,0	26	34	43	69	93	137	160	2,22
M 14	0,10	16,9	22,5	28,2	45,1	60,6	88,9	104,1	33	44	55	88	117	172	201	1,94
	0,12	16,5	21,9	27,4	43,9	59,1	86,7	101,5	37	50	62	100	133	195	229	2,26
	0,14	16,0	21,3	26,7	42,7	57,5	84,4	98,8	41	55	69	111	148	218	255	2,58
M 16	0,10	23,2	30,9	38,6	61,8	82,9	121,7	142,4	50	67	84	134	180	264	309	2,17
	0,12	22,6	30,1	37,6	60,2	80,9	118,8	139,0	57	76	96	153	206	302	354	2,54
	0,14	22,0	29,3	36,6	58,6	78,8	115,7	135,4	64	85	107	171	230	338	395	2,92
M 18	0,10	28,2	37,7	47,1	75,3	104	149	174	70	93	117	187	259	369	432	2,48
	0,12	27,5	36,7	45,8	73,4	102	145	170	80	106	133	212	295	421	492	2,90
	0,14	26,7	35,7	44,6	71,3	99	141	165	89	118	148	236	329	469	549	3,32
M 20	0,10	36,2	48,3	60,3	96,5	134	190	223	98	131	164	262	363	517	605	2,71
	0,12	35,3	47,0	58,8	94,1	130	186	217	112	150	187	300	415	592	692	3,18
	0,14	34,3	45,8	57,2	91,6	127	181	212	125	167	209	334	464	661	773	3,65
M 22	0,10	45,1	60,1	75,2	120,3	168	237	277	132	176	220	353	495	704	824	2,95
	0,12	44,0	58,7	73,4	117,4	162	231	271	151	202	252	403	567	807	945	3,46
	0,14	42,9	57,1	71,4	114,3	158	225	264	169	225	282	451	634	904	1057	3,97
M 24	0,10	52,1	69,5	86,9	139,0	192	274	320	169	226	282	451	625	890	1041	3,25
	0,12	50,8	67,7	84,7	135,5	188	267	313	193	257	322	515	714	1017	1190	3,80
	0,14	49,4	65,9	82,4	131,8	183	260	305	215	287	359	574	796	1136	1329	4,36
M 27	0,10	68,4	91,2	114,0	182,4	252	359	420	248	331	414	662	915	1304	1526	3,63
	0,12	66,7	89,0	111,2	178,0	246	351	410	284	379	474	759	1050	1496	1750	4,26
	0,14	65,0	86,7	108,3	173,3	240	342	400	318	424	530	848	1176	1674	1959	4,89
M 30	0,10	83,2	111,0	138,7	222,0	307	437	511	338	450	563	901	1246	1775	2077	4,06
	0,12	81,2	108,3	135,3	216,5	300	427	499	386	515	644	1031	1420	2033	2380	4,76
	0,14	79,0	105,4	131,7	210,8	292	416	487	431	575	719	1151	1597	2274	2662	5,46
M 33	0,10	103,5	138,0	172,5	276,0	381	543	635	456	608	760	1216	1679	2392	2799	4,41
	0,12	101,0	134,7	168,4	269,4	373	531	621	523	697	871	1395	1928	2747	3214	5,17
	0,14	98,4	131,2	164,0	262,5	363	517	605	585	780	975	1560	2161	3078	3601	5,95
M 36	0,10	121,6	162,1	202,7	324,3	448	638	747	587	783	979	1586	2184	3082	3607	4,83
	0,12	118,7	158,2	197,8	316,4	438	623	729	672	897	1121	1793	2482	3535	4136	5,67
	0,14	115,6	154,1	192,6	308,1	427	608	711	752	1002	1253	2005	2778	3957	4631	6,51
M 39	0,10	145,9	194,5	243,1	389,0	537	765	895	758	1011	1264	2022	2791	3975	4652	5,20
	0,12	142,4	189,9	237,4	379,8	525	748	875	870	1160	1450	2321	3208	4569	5346	6,11
	0,14	138,8	185,0	231,3	370,0	512	729	853	974	1299	1624	2598	3597	5123	5994	7,02

6 Lightning protection and potential equalization - important notes

- Lightning protection is not mandatory but is recommended by Schletter
- Anodization or powder-coating of the rack's interior connections **does not** negatively impact the load-bearing capacity with regard to lightning protection!
- Fundamentally, in the case of anodized or powder-coated IsoTop racks, all conductive components of the IsoTop assembly which could come into contact with live components, are to be incorporated into the potential equalization. We recommend that all individual module-bearing profiles lying one below the other be connected electrically then, subsequently, that each resulting module block be connected with low impedance to the earthing system. Similarly, all supports, clamps, etc. used for cable routing, or which come into contact with live components must be earthed. Overall responsibility for the earthing procedures and for the inspection of protective measures prior to operation lies with the designated electrical engineering company.

7 Warnings



Risk of falling!

The risk of falling is always present when working on the roof. Stepping onto a module can result in slipping. Compliance with legally defined accident prevention procedures is mandatory when working on the roof. According to the procedures for the prevention of accidents, a safety harness or protective platform must be used. Do not step on the solar modules.



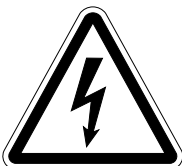
Risk of injury!

There is a risk of injuring others if objects fall from the roof. Apparatus must be secured with a safety line to a stable point, to prevent objects from sliding off. The danger area on the ground must be sealed off to protect passers-by from potential injury from falling objects.



Warning! Risk of breakage!

PV modules can be damaged if stepped upon. Do not step on the PV modules.



Risk of electric shock!

Electric cables and solar plant components carry a permanent electrical voltage with light incidence. Touching conductive components can result in electric shock. All operations with electrical equipment must be carried out exclusively by qualified experts.