

Idejna zasnova projekta- IZP

SE OŠ KDK Telovadnica 2
Koroška cesta 7
3325 Šoštanj

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2.1 SPLOŠNO

Investitor namerava zgraditi na strehi obstoječega objekta: Osnovna šola Karel Destovnik Kajuh na naslovu Koroška cesta 7, 3325 Šoštanj, na parc. št. 341/3 k.o. 959 Šoštanj, sončno fotovoltaično elektrarno moči 200 kW.

Proizvodna naprava SE OŠ KDKD telovadnica2 :

Št. PV modulov: 408

Nazivna moč modula: 530 Wp

Skupna instalirana moč modulov: 216 540 W

Št. razsmernikov: 2, Solar Edge

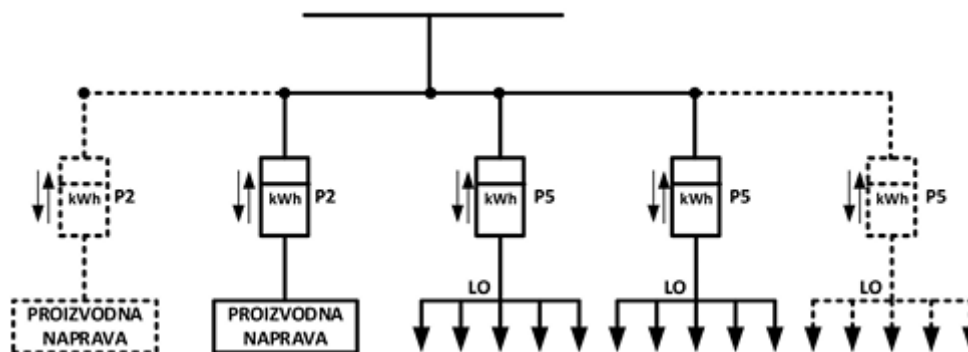
Nazivna moč razsmernika 1: 100 kW

Nazivna moč razsmernika 2: 100 kW

Oddajna moč razsmernika bo omejena glede na pridobljeno soglasje.

Proizvodna naprava bo sestavljena iz PV generatorja na strehi objektov in razsmernika.

V NNO obstoječe TP bo vključena po shemi PS3.B (SONDSEE Ur. I. RS št. 7/21), skladno z Prilogo 5 Navodila za priključevanje in obratovanje proizvodnih naprav in hranilnikov, priključenih v distribucijsko elektroenergetsko omrežje.



Idejna zasnova je s svojimi rešitvami namenjena investitorju kot osnova, na podlagi katere se investitor lahko odloča za izgradnjo sončne elektrarne ter soglasodajalcem, na podlagi katere le-ta lahko izda soglasje in morebitne projektne pogoje. Pri tem je potrebno tudi upoštevati, da je idejna zasnova s svojimi izračuni in podatki le ocena bodoče moči sončne elektrarne. Za dejanske podatke in natančne vrednosti je potrebno izdelati ustrezno projektno dokumentacijo - projekt za izvedbo (PZI).

Sončna elektrarna deluje na principu direktne pretvorbe sončnega sevanja v električno energijo. Proizvedena električna energija se oddaja-prodaja v lokalno/interno električno omrežje.

Osnovni elementi sončne elektrarne so :

- sončni moduli (mono ali poli kristalni),
- razsmerniki, (pretvorba iz enosmerne v izmenično napetost, sinhronizacija z omrežjem),
- ločilno priključno merilno mesto
- oddaja električne energije v distribucijsko omrežje (meritve, zaščita in glavno ločilno stikalo),
- priključek na distribucijsko omrežje (NN kablovod, predelave v PMO),
- montažni pribor za module
- podkonstrukcija,
- inštalacijske povezave,
- ozemljitve
- strelovod,

2.2 PRIKLOP NA DISTRIBUCIJSKO OMREŽJE

Obstoječ objekt ima napajanje izvedeno preko distribucijskega NN omrežja. Števec P5 se zamenja za dvosmernega. Dogradi se števec P2.

2.3 PRENAPETOSTNA ZAŠČITA

Za znižanje nevarnosti poškodb elektronske opreme se v okviru gradnje FE uredi prenapetostne zaščite, tako na DC strani, kot AC. Na lokaciji pri razsmernikih se v AC/DC omarice vgradijo:

- v primeru ločene elektrarne od strelovoda - odvodniki razreda II,
- v primeru povezane elektrarne s strelovodom - odvodniki razreda I+II.

Na DC strani se uporabijo elementi primerni za fotovoltaične generatorje z min. 1000 V DC, na AC strani pa s 300 V AC trajne zdržne napetosti.

V priključne merilne omarice se vgradijo AC prenapetostne zaščite razreda I+II, skladno s pogoji distribucijskega podjetja.

2.4 OZEMLJILNI SISTEM

Za ozemljilo se uporabi Fe/Zn trak, dimenzije 25 x 4 mm, položen v obliki zaključene krožne zanke 1 m okoli objekta in položen 0,7 m globoko v zemljo.

Uporabi se obstoječe ozemljilo.

2.5 IZENAČITEV POTENCIALOV

Izenačenje potenciala služi zaščititi pred električnim udarom na omrežni strani in prenapetostni zaščiti uporabljenih električnih naprav. Zbiralnica je povezana z glavno zbiralnico za izenačenje potenciala (GIP), ki je povezana s strelovodno ozemljitvijo. Dodatno priključimo kovinsko ohišje razsmernika in PE sponke spojišča.

2.6 ZAŠČITA PRED ELEKTRIČNIM UDAROM na strani solarnega generatorja

Solarni moduli so izolirani v skladu z zaščitnim razredom II (1000 VDC). Instalacija mora prav tako ustrezati pogojem zaščitne ločitve. Vodnika za plus in minus pol imata dvojno izolacijo. Vodniki med solarnimi moduli morajo biti mehanično zaščiteni pred poškodbami zaradi vetra ali plazenja ledu. Izolacijsko upornost je treba občasno kontrolirati. V razsmerniku je vgrajen kontrolnik upornosti izolacije na enosmerni strani, ki v primeru nizke vrednosti loči razsmernik od omrežja.

2.7 STRELOVODNA INSTALACIJA

Obstoječi objekt, na katerega se predvideva izgradnja FE, ima izveden strelovodni sistem razreda IV. Strelovod je namenjen prestrezanju, odvajanju in porazdelitvi toka strele v zemljo. Pri tem se na zaščitenem objektu ne smejo pojaviti škode in hkrati ščiti nameščeno SE na strehi objekta. Sestavljen je iz lovilne mreže, odvodov in sistema ozemljil, ki tvorijo pot toka strele med točko udara in zemljo. Strelovodna instalacija sme biti narejena le z elementi, predvidenimi po veljavnih predpisih. Ozemljitveni vodniki se polagajo v čim bolj ravnih linijah tako, da se izognejo ostrim zavojem ter nepotrebnim prekinitvam. Največja dopustna sprememba smeri je 90°, krivinski radij pa 20 cm. Lovilna mreža je kombinirana s kovinskimi palicami, ki lahko ustrezno ščitijo opremo elektrarne. Gorljivi in kovinski deli objekta ne smejo priti v neposreden stik z deli strelovodne napeljave. Ozemljitveni sistem elektrarn in strelovodov na stavbah bo obstoječ, njegovo ustreznost pa bo potrebno pred gradnjo preveriti z meritvami.

2.8 FOTONAPETOSTNI GENERATOR

Fotonapetostni paneli bodo nameščeni na streho objekta. Konstrukcija in paneli bodo montirani na strešne dele, ki bodo omogočali dostop za potrebe obratovanja in vzdrževanja fotovoltaičnega generatorja. Predvidena je uporaba fotonapetostnih monokristalnih panelov tip SOLVIS SW 144 E HCm 10 z zmogljivostjo $P_{mpp}=530$ Wp, nazivno obratov. napetostjo $U_{mpp}=42,31$ V, napetostjo odprtih sponk $U_{oc}=49,11$ V in deklariranim izkoristkom 21,09 %. Za izboljšanje učinka generatorja, zvišanje požarne varnosti in izklop generatorja v primeru izpada oz. izklopa mrežnega napajanja bo za vsak panel montiran optimizator. Ta bo v primeru breznapetostnega

stanja napajanja zagotavljal na izhodu panela zgolj 1 V DC napetosti, tudi v primeru visokih zunanjih osvetljenosti. Skupna napetost vsakega niza bo tako omejena na varno malo napetost in nenevarna za poseganje, upravljanje in gašenje.

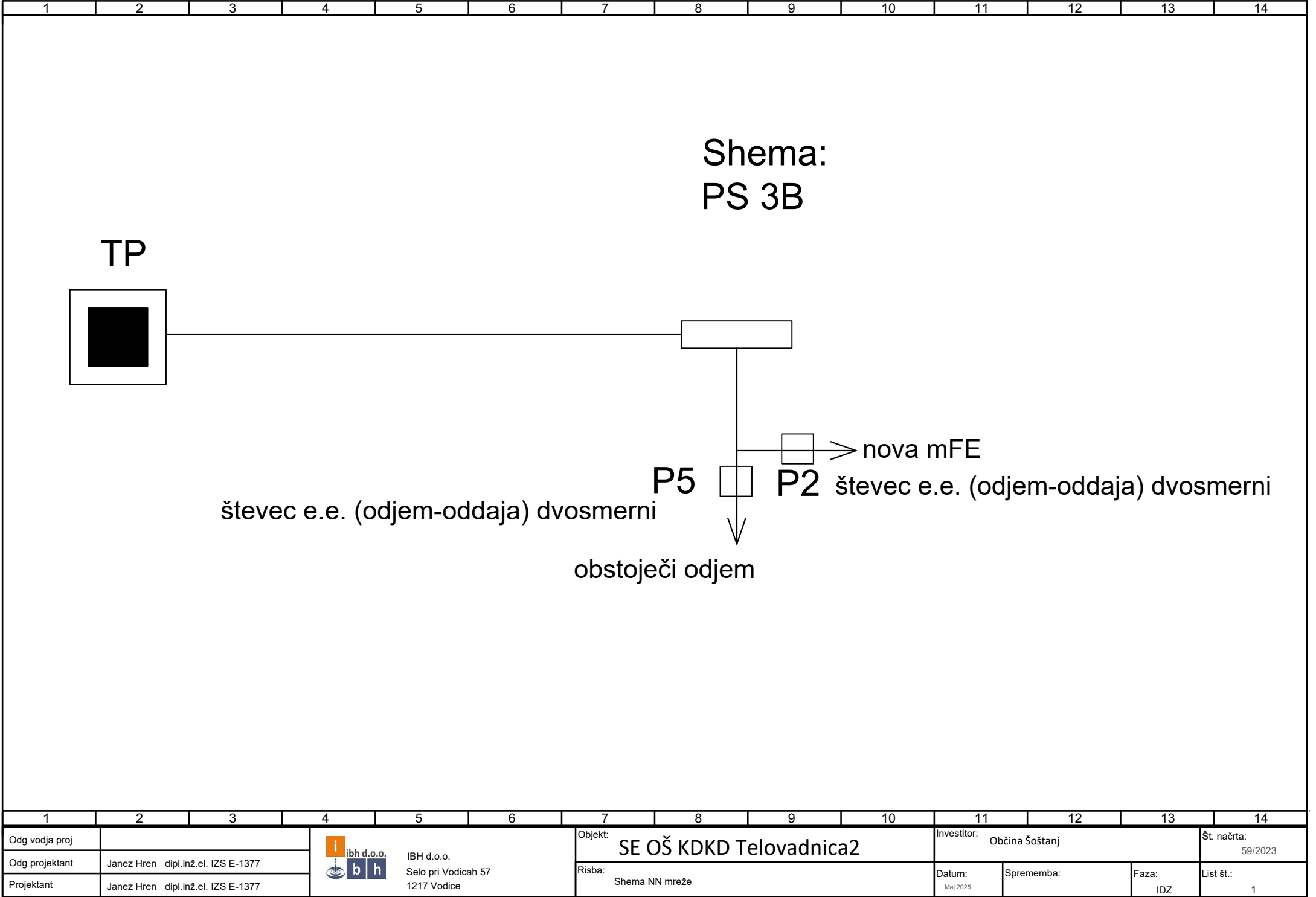
2.9 RAZSMERNIKI

Aktivna oprema z razsmernikom in priključnimi omaricami bo nameščena na zunanosti objekta. Priključitev bo izvedena preko obstoječe omare Rg. Uporabljeni bodo DC/AC razsmerniki proizvajalca Solar Edge .

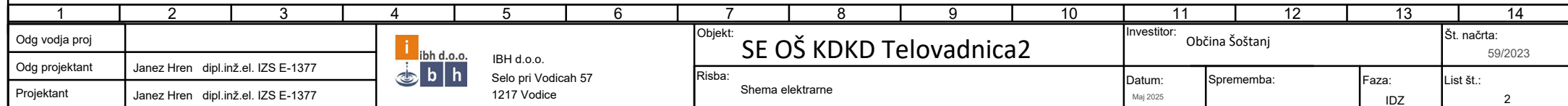
2.10 OPTIMIZATORJI MOČI

Optimizatorji moči so DC/DC pretvorniki, ki imajo na vhodu priključen en ali dva PV modula, izhod pa je vezan v string razsmernika. Uporaba optimizatorjev ima več prednosti:

- Monitoring delovanja na nivoju PV modulov
- Sledenje točki največje moči na nivoju PV modulov
- Zagotovitev breznapetostnega stanja ob izklopu razsmernika
- Neobčutljivost stringa na delno senčenje posameznih modulov



IBH d.o.o.
Selo pri Vodica 57
1217 Vodice



Three Phase Inverter with Synergy Technology For Europe

SE50K / SE66.6K / SE90K / SE100K



INVERTERS

Powered by unique pre-commissioning process for rapid system installation

- / Pre-commissioning feature for automated system validation and wiring during site installation and prior to grid connection
- / Easy two-person installation with lightweight, modular design (each inverter consists of two or three Synergy Units and one Synergy Manager)
- / Independent operation of each Synergy Unit enables higher uptime and easy serviceability
- / Built-in thermal sensors detect faulty wiring, ensuring enhanced protection and safety
- / Designed to automatically reduce high DC voltage to touch-safe levels upon grid/inverter shutdown, with SafeDC™ and optional rapid shutdown
- / Built-in arc fault protection
- / Built-in PID mitigation for maximized system performance
- / Monitored* and field-replaceable surge protection devices to better withstand surges caused by lightning or other events
- / Streamlined cabling and lower BoS costs with single DC connection option
- / Optional integrated DC safety switch eliminates the need for external DC isolators
- / Built-in module-level monitoring with Ethernet or cellular communication for full system visibility

*Applicable only for DC and AC SPDs

/ Three Phase Inverter with Synergy Technology

For Europe

SE50K / SE66.6K / SE90K / SE100K

Applicable to inverter with part number	SExxK-xxx0lxxxx				Units
	SE50K ⁽¹⁾ For 400V Grid	SE66.6K For 400V Grid	SE90K For 400V Grid	SE100K For 400V Grid	
OUTPUT					
Rated AC Active Output Power	50,000 ⁽²⁾	66,600	90,000	100,000	W
Maximum AC Apparent Output Power	50,000 ⁽²⁾	66,600	90,000 ⁽³⁾	100,000	VA
AC Output Voltage – Line to Line / Line to Neutral (Nominal)	380 / 220; 400 / 230				Vac
AC Output Voltage – Line to Line Range / Line to Neutral Range	304 – 437 / 176 – 253; 320 – 460 / 184 – 264.5				Vac
AC Frequency	50/60 ± 5%				Hz
Maximum Continuous Output Current (per Phase)	72.5	96.5 ⁽⁴⁾	130.5 ⁽⁵⁾	145 ⁽⁶⁾	Aac
AC Output Line Connections	3W + PE, 4W + PE				
Supported Grids	WYE: TN-C, TN-S, TN-C-S, TT, IT; Delta: IT				
Maximum Residual Current Injection ⁽⁷⁾	200			300	mA
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Thresholds	Yes				
Total Harmonic Distortion	≤ 3				%
Power Factor Range	± 0.2 to 1				
INPUT					
Maximum DC Power (Module STC) Inverter / Synergy Unit	87,500 / 43,750	116,550 / 58,275	157,500 / 52,500	175,000 / 58,300	W
Transformer-less, Ungrounded	Yes				
Maximum Input Voltage DC+ to DC-	1000				Vdc
Operating Voltage Range	680 – 1000				Vdc
Maximum Input Current	2 x 36.25	2 x 48.25	3 x 43.5	3 x 48.25	Adc
Reverse-Polarity Protection	Yes				
Ground-Fault Isolation Detection	167 kΩ sensitivity per Synergy Unit ⁽⁸⁾				
Maximum Inverter Efficiency	98.3				%
European Weighted Efficiency	98				%
Nighttime Power Consumption	< 8			< 12	W
ADDITIONAL FEATURES					
Supported Communication Interfaces ⁽⁹⁾	2 x RS485, Ethernet, Wi-Fi (optional), Cellular (optional)				
Smart Energy Management	Export limitation				
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi access point for local connection				
Arc Fault Protection	Built-in, user configurable (according to UL 1699B)				
Rapid Shutdown	Optional (automatic upon AC Grid Disconnect)				
PID Rectifier	Nighttime, built-in				
RS485 Surge Protection (ports 1 + 2)	Type II, field replaceable, integrated				
DC Surge Protection	Type II, field replaceable, integrated				
AC Surge Protection	Type II, field replaceable, optional				
DC Fuses (Single Pole)	Optional, 25 A / 30 A				
DC Disconnect Switch	Optional				
Pre-Commissioning	Built-in ⁽¹⁰⁾				
VAR at Night ⁽¹¹⁾	Yes				
Safety	IEC 63027; IEC 62109-1; IEC 62109-2; AS3100				
Grid Connection Standards ⁽¹²⁾	EN 50549-1; EN 50549-2; VDE-AR-N 4105; VDE-AR-N 4110; VDE V 0126-1-1; CEI 0-21, CEI 0-16; TOR Erzeuger Typ A+B; G99 Type A+B; G99 (NI) Type A+B; VFR 2019				
Emissions	IEC 61000-6-2; IEC 61000-6-3 Class A; IEC 61000-3-11; IEC 61000-3-12				
RoHS	Yes				

(1) Not available in all countries. For details about the supported inverters in your country, see [Countries Supported by the SolarEdge Inverters](#).

(2) 49,990 in the UK.

(3) When using country settings that follow VDE-AR-N 4110, the Maximum AC Apparent Output Power is 100,000 VA.

(4) When using country settings that follow VDE-AR-N 4110, the Maximum Continuous Output Current per Phase is 107.4 A.

(5) When using country settings that follow VDE-AR-N 4110, the Maximum Continuous Output Current per Phase is 145 A.

(6) When using country settings that follow VDE-AR-N 4110, the Maximum Continuous Output Current per Phase is 161.1 A.

(7) If an external RCD is required, its trip value must be ≥ 200 mA for SE50K and SE66.6K; ≥ 300 mA for SE90K and SE100K.

(8) Where permitted by local regulations.

(9) For specifications of the optional communication options, visit the [Communication page](#) on the SolarEdge website or download the relevant product datasheet from the [Knowledge Center](#).

(10) Not available for P/Ns SExxK-xxxxBPxx.

(11) For details, see [Set Volt Ampere Reactive at Night](#).

(12) For all standards and certificates download, refer to the [Certificates category](#) in the Knowledge Center.

/ Three Phase Inverter with Synergy Technology

For Europe

SE50K / SE66.6K / SE90K / SE100K

Applicable to inverter with part number	SExxK-xxx0lxxxx				Units
	SE50K For 400V Grid	SE66.6K For 400V Grid	SE90K For 400V Grid	SE100K For 400V Grid	
INSTALLATION SPECIFICATIONS					
Number of Synergy Units per Inverter	2		3		
AC Wire Cross Section and Outer Diameter: Line/PE (Aluminum or Copper)	Cross section up to 120 / 70 mm ² ; outer diameter 30-50 / 12-20 mm				
DC Input: Inverter / Synergy Unit ⁽¹²⁾⁽¹³⁾	8 / 4 MC4 pairs		12 / 4 MC4 pairs		
	Gland, 2 pairs / 1 pair, cross section 25 – 70 mm ² , aluminum or copper Cable outer diameter 12 – 20 mm		Gland, 3 pairs / 1 pair, cross section 25 – 70 mm ² , aluminum or copper Cable outer diameter 12 – 20 mm		
Dimensions (H x W x D)	Synergy Unit: 558 x 328 x 273 Synergy Manager: 360 x 560 x 295				mm
Weight	Synergy Unit: 32 Synergy Manager: 18				kg
Operating Temperature Range	-40 to +60 ⁽¹⁴⁾				°C
Cooling	Fan (user replaceable)				
Noise	< 67				dBA
Protection Rating	IP65 – outdoor and indoor				
Mounting	Brackets provided				

(13) DC input is available with MC4 or Gland connection under the inverter part number. For more information, contact SolarEdge.

(14) Only MC4 connectors manufactured by Staubli are approved for use.

(15) For power de-rating information refer to the [Temperature Derating](#) technical note.

Accessories - SPDs (purchased separately)	
Accessory	P/N
AC SPD kit for Synergy Manager (5 units per box)	SE-AC-SPD-SM

SolarEdge is a global leader in smart energy technology. By leveraging world-class engineering capabilities and with a relentless focus on innovation, SolarEdge creates smart energy solutions that power our lives and drive future progress.

SolarEdge developed an intelligent inverter solution that changed the way power is harvested and managed in photovoltaic (PV) systems. The SolarEdge DC optimized inverter maximizes power generation while lowering the cost of energy produced by the PV system.

Continuing to advance smart energy, SolarEdge addresses a broad range of energy market segments through its PV, storage, EV charging, UPS, and grid services solutions.

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CE RoHS

solaredge

MODEL SV144 E HCM10



Premium quality



Power output
range 530-545 Wp



100% EL testing



Mechanical load
up to 5400 Pa



Low weight



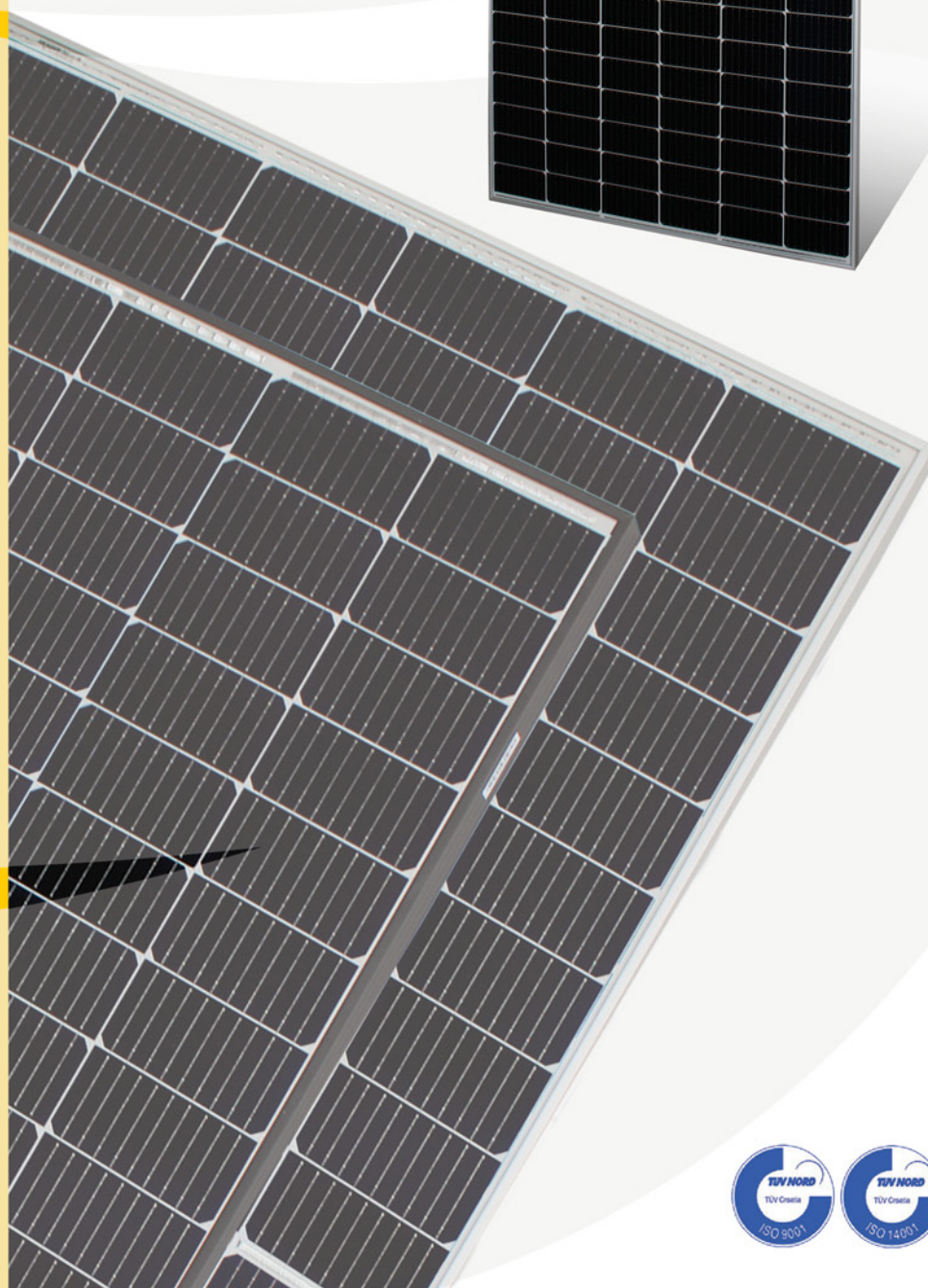
Module efficiency
up to 21,09%



Positive power
tolerance -0/+5 W



IEC EN 61215-1,-1-1,-2
IEC EN 61730-1,-2



Warranty:

15 years manufacturing defects

12 years limited,
90% output power

25 years limited,
80% output power



Electrical parameters at Standard Test Conditions (STC)

MODEL		SV144-530 E HCM10	SV144-535 E HCM10	SV144-540 E HCM10	SV144-545 E HCM10
Peak power P_{MPP}	[W]	530	535	540	545
Peak power tolerance	[W]	-0/+5			
Short circuit current I_{SC}	[A]	13,87	13,89	13,93	13,95
Open circuit voltage V_{OC}	[V]	48,68	48,76	48,97	49,11
Rated current I_{MPP}	[A]	12,68	12,76	12,86	12,92
Rated voltage V_{MPP}	[V]	41,81	41,94	42,18	42,31
Current and voltage tolerance	[%]	± 3			
Module efficiency	[%]	20,51	20,70	20,89	21,09

STC: 1000W/m² irradiance, 25 °C cell temperature, AM1, 5 g spectrum according to EN 60904-3
Average relative efficiency reduction of 3,4 % at 200 W/m² according to EN 60904-1

Electrical parameters at Nominal Module Operating Temperature (NMOT)

MODEL		SV144-530 E HCM10	SV144-535 E HCM10	SV144-540 E HCM10	SV144-545 E HCM10
Peak power P_{MPP}	[W]	391,7	395,5	400,8	404,0
Peak power tolerance	[W]	-0/+5			
Short circuit current I_{SC}	[A]	11,21	11,23	11,26	11,28
Open circuit voltage V_{OC}	[V]	44,5	44,6	44,8	44,9
Rated current I_{MPP}	[A]	10,23	10,30	10,38	10,44
Rated voltage V_{MPP}	[V]	38,3	38,4	38,6	38,7

NMOT: module operating parameters at 800 W/m² irradiance, 20 °C ambient temperature, 1 m/s wind speed

MECHANICAL DATA

Dimensions (H x W x D)	[mm]	2279 x 1134 x 35
Weight	[kg]	29,0
Solar cells		144 cells, mono-Si, 182x91 mm +/- 1 mm
Cells encapsulation		Ethylene vinyl acetate (EVA)
Front		Tempered solar glass, 3,2 mm
Back		Composite polyester Film
Frame		Anodized aluminium frame with twin-wall profile and drainage holes
Junction box		min. IP67 with 3 Bypass diodes,
Cable and connectors		Solar cable 4 mm ² , length >300 mm, MC4 compatible connectors

NOTE: For extended models, SV144 E HCM10, voltages and currents can vary where YYY is optional based on the chosen YYY variant (YYY = letter(s), F for black frame, B for silver frame and black backsheet, BC for full black module)

OPERATING CONDITIONS

Temperature range	[°C]	-40 to +85
Maximum system voltage	[V]	1500
Max. series fuse rating		25A
Limiting reverse current		20A
Maximum surface load capacity		5400 Pa (Snow load)
Resistance against hail		Max. diameter of 25 mm with impact speed 23 m/s

THERMAL CHARACTERISTICS

Temperature coefficient of P_{MPP}	[%/K]	-0,36
Temperature coefficient of I_{SC}	[%/K]	0,05
Temperature coefficient of V_{OC}	[%/K]	-0,28

