

# Technical Datasheet

Solar pump driving system with hybrid power supply from photovoltaic panels (PV Plant) and three-phase AC Grid (Mains and/or Diesel Gen-Set)  
"Solar Power Control System / Hybrid - SPCS/H"



## SPCS/H xx-400 COMBINER BOX Technical Data

System Type	SPCS/H 22-400 Combiner	SPCS/H 30-400 Combiner	SPCS/H 37-400 Combiner	SPCS/H 45-400 Combiner	SPCS/H 55-400 Combiner	SPCS/H 75-400 Combiner
Output Power Ratings Data						
Frequency Converter Type	SPCS/H 22-400	SPCS/H 30-400	SPCS/H 37-400	SPCS/H 45-400	SPCS/H 55-400	SPCS/H 75-400
Applicable Pump Motor AC Induction Motor Power	22 kW / 30 HP	30 kW / 40 HP	37 kW / 50 HP	45 kW / 60 HP	55 kW / 75 HP	75 kW / 100 HP
Frequency Converter Output Power Capacity	37 kVA	50 kVA	60 kVA	72 kVA	88 kVA	120 kVA
Rated Output Voltage Rated Motor Voltage	3~ 400 V <sub>rms</sub> (from 0 to U <sub>SUPPLY</sub> )					
Output Frequency	0÷100 Hz (512 Hz upon request) variable frequency; frequency parameters are software adjustable					
Rated Output Current	48 A <sub>rms</sub>	64 A <sub>rms</sub>	75 A <sub>rms</sub>	96 A <sub>rms</sub>	113 A <sub>rms</sub>	152 A <sub>rms</sub>
Overload Current	120% for up to 1 minute, once per 10 minutes					
PV Input Power Ratings Data						
Max Input Voltage PV Open-circuit Voltage (V <sub>oc</sub> )	800 V <sub>DC</sub>					
MPPT Range	450 ÷ 650 V <sub>DC</sub>					
PV Side Contactors	DC Contactors "PV+" / "PV-"					
PV Side Fusing	2 x 80A 20kAdc / gPV 1000Vdc / NH0	2 x 100A 20kAdc / gPV 1000Vdc / NH0	2 x 125A 20kAdc / gPV 1000Vdc / NH0	2 x 160A 20kAdc / gPV 1000Vdc / NH0	2 x 200A 10kAdc / gPV 1000Vdc / NH1	2 x 250A 10kAdc / gPV 1000Vdc / NH2
PV Side Overvoltage Protection	Surge Arrester 1000 V <sub>DC</sub> / Class II (Type 2) / 3+0 / I <sub>max</sub> =40kA					
Number of PV Strings Installation Recommendation	8 (9)	10 (11)	12 (13)	15 (16)	18 (19)	23 (24)
PV Plant String Panels Installation Recommendation	8 (9) x 20PV [255÷300]W <sub>p</sub>	10 (11) x 20PV [255÷300]W <sub>p</sub>	12 (13) x 20PV [255÷300]W <sub>p</sub>	15 (16) x 20PV [255÷300]W <sub>p</sub>	18 (19) x 20PV [255÷300]W <sub>p</sub>	23 (24) x 20PV [255÷300]W <sub>p</sub>
AC Input Power Ratings Data						
AC Grid Voltage Mains Voltage	3~ 400 V <sub>rms</sub> ±15% / 50(60) Hz					
AC Input Current	63 A <sub>rms</sub>	80 A <sub>rms</sub>	100 A <sub>rms</sub>	125 A <sub>rms</sub>	160 A <sub>rms</sub>	200 A <sub>rms</sub>
AC Side Overvoltage Protection	Surge Arrester Type 2 / 3+0 / I <sub>max</sub> =50kA					
Additional Power Features & Options – power converter matched output chokes (reactors) and output sine filters (depending on the output power line cable length, i.e. depending on whether the distance, between the converter output and the pump motor input could be defined as "long cable line"); converter matched input power line chokes (reactors).						
Application and Environmental Data						
Operating Temperature	-20°C to +50°C					
Ingress Protection Degree	IP23 (option ≥ IP54)					
Altitude	≤ 2000m (above 2000m – derating or design implementation upon request, considering the altitude requirements)					
International Norms and Directives Compliance	EN 61439-2:2011; EN 62109-1:2010; EN 62109-2:2011; EN 61800-5-1:2007; EN 61800-3 C2					
Indication & Control – Control Part Features and Options						
Indication Keyboard	LCD 2 Lines x 20 Characters, RGB backlight; Control stack keyboard for parameters adjustment during installation, commissioning and maintenance support.					
Operation Modes	Manual / Automatic (front panel control switch "Manual / OFF / Auto")					
Communication Interface Control Inputs and Outputs	RS 232/485 (Modbus RTU, as standard variant); Additional communication interface, optional: CAN, Ethernet, ZigBee (wireless); Configurable (programmable) digital and analogue inputs / outputs for interconnection with outside control sensors, systems and pumps variable speed control.					
AC Induction Motor Control Methods	PV MPPT based constant U/f control; Variable Torque U/f or linear (constant torque) U/f; Flux vector control; Possibility for operation with speed feedback (closed loop) control;					
Carrier (PWM) Frequency	4kHz to 12kHz (software adjustable)					

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Built-in Electronic Protections	Over Voltage, Under Voltage, Over Current, Short Circuit, Over Load, Earth Fault, Output Phase Loss / Interruption, Overheating, PV Power Line Reversal, AC Power Supply Line Disturbance, Pump Dry Run
Monitoring & Diagnostics	Faults history for protection tripping; Data logging of converter base measured and calculated parameters in running mode; Maintenance indication and maintenance interval adjustment; Service/duty life monitoring; Pump runtime hours counting; "Prepaid" energy function – remaining prepaid energy monitoring;

### SPCS/H xx-400 Additional Features & Functionality Options

**Simultaneous Supply from Hybrid Power Source** providing system power supplying from PV installation and three-phase AC power line (Mains and/or Diesel Gen-Set) – simultaneously and without power sources changeover:

- Utilizing the maximum possible energy from the PV Plant installation, by priority. If there is not enough PV power (low solar irradiance) for the pump station operation, then compensation of the energy shortage by supplementing the power supply demands with AC Grid consumption, while utilizing the present, transitory PV panels power. Sustaining the pump system operation, regardless of the inconsistency of the renewable energy source.
- Each of the converter power-supply inputs could sustain the rated (nominal) power for the corresponding pump system (station) driving. The system could operate at full power even if some of the power sources is interrupted.
- Operation solely with PV power supply, if there is enough solar irradiation for sustaining the minimal or higher than minimal pump speed, relevant to the maximum power point tracking of the PV Plant.
- Operation solely with three-phase AC Grid supply. If there are requirements, for pump station nighttime duty, the system will operate efficiently solely with Mains and/or Diesel Gen-Set supply. During the daytime duty will be utilized the maximum possible PV installation power.

**Converter Control Stack Autonomous Power Supply Lines** providing independency from the converter power stack supply lines, ensuring the automatic power stack making and breaking to the input power source lines (PV installation and AC Grid installation).

**Optional Pump Control Dedicated Features** providing flexible pump station control (independent pump control systems for parallel cascaded pumps staging) without the need of PLCs or other separate pump control units, just utilizing the system variable frequency converters (SPCS/H xx-400):

- One of the system drives operates as Master and controls the cascaded pump station duty-point. For instance, the master drive tracks the pump system pressure and via communication interface gives a reference command for the rest of the variable speed (frequency) drives, respectively variable speed pumps. That kind of pump system control is most efficient, sustaining the most efficient pump system duty-point, respectively achieving most energy savings.
- Possibility for obtaining of "Master Follower" functionality via an internal Master-Slave communication network between the frequency-converters in the pump system, which reduces the intricacy between the drives interconnection.
- Cascaded pumps runtime hours balancing.
- "PID" loops for pumping process control via system feedbacks from different inter-system sensors and transducers. For instance, tracking and regulating the pump system pressure. Pipeline filling functionality with relevant pump speed control, as a precaution against "water hammer" phenomenon in the piping system (pipes, pipe connections, check-valves and other system devices). Pipelines leakage detection based on the pump speed and the tracked instantaneous system pressure. Flow compensation for reducing the friction losses in large systems and achieving energy savings.
- Check valves speed ramping. Initial/final speed ramps with different two or three stage ramping slopes.
- Pump cleaning (de-ragging) functionality.
- System "Pre-lubricating / Blowering" functionality.
- "Flow confirmation" function.
- Pump stirring function.
- Sleep mode / Stand-by mode, reducing the system power consumption to its minimum.
- Possibility for designing and controlling of solar pumping stations, composed by several parallel connected (cascaded) pumps, ensuring the requirements for higher flow rates in larger-scale pump systems, respectively utilizing larger-scale PV plant installations.

**Water Level Control Module** implementing two sets of sensors for utilization in draw-well and water tank applications. High and low liquid level control. LED indication. Applicable for conductive liquids.

**Drive Remote Control Panel** providing additional possibility for system parameter adjustment, diagnostics and visualization of logged data via communication port. Installation, commissioning and maintenance support. The module is "pocket" sized and plug & play applicable. In most cases, the drive remote control panel skips the need for using a "notebook" for system adjustment and maintenance activities.

**PLC & HMI** integration for ensuring of additional system requirements, for instance a SCADA implementation for the pump system (pump station) procurator or operator.

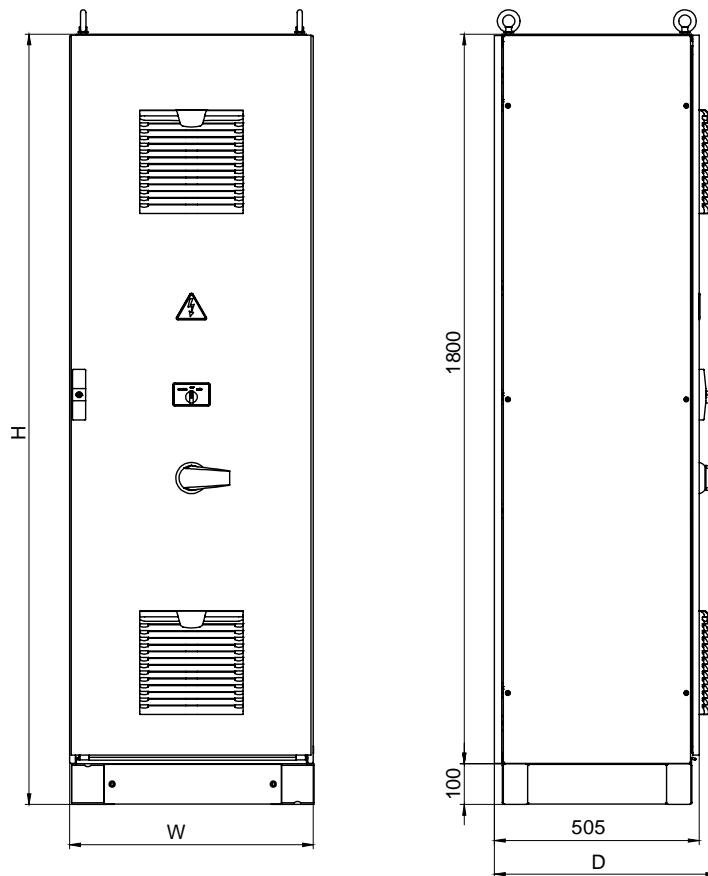
**PV String Monitoring** implemented by PV string combiner boxes ("Electroinvent EAD" models SCB-xx-1000), which include string monitoring module with ZigBee wireless communication. Respectively, the SCB-xx-1000 could communicate directly with the frequency converter Control Stack in the system SPCS/H xx-400 Combiner Box.

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### Dimensions



SPCS/H xx-400 COMBINER BOX Overall Dimensions, [mm]

**NOTE:**

*Depending on the installation requirements and options, the COMBINER BOX dimensions and configuration may differ from these, presented at the diagram above!*

Type	Overall dimensions, [mm]		
	W	H	D
SPCS/H 22-400 Combiner	600	1300	548
SPCS/H 30-400 Combiner	600	1700	548
SPCS/H 37-400 Combiner	600	1700	548
SPCS/H 45-400 Combiner	600	1900	548
SPCS/H 55-400 Combiner	800	1900	548
SPCS/H 75-400 Combiner	800	1900	548

### Contacts

  
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