

TURNKEY SOLUTION
for utility-scale solar PV plants

Ingeteam



TURNKEY SOLUTION

integrating all
the necessary
elements for
a fast
on-site installation:

- **CENTRAL INVERTERS**
- **PAD-MOUNTED
TRANSFORMER**
- **AUXILIARY SERVICES
PANEL**
- **AUXILIARY SERVICES
TRANSFORMER**



INGECON® SUN PMT. Power Station from 2 to 7.65 MVA

Medium voltage Power Station supplied as an all-in-one solution

This brand new medium voltage solution integrates all the devices required for a multimewatt system.

Maximize your investment with a minimal effort

Ingeteam's Power Station is a compact, customizable and flexible solution that can be configured to suit each customer's requirements. It is supplied together with up to two photovoltaic inverters. All the equipment is suitable for outdoor installation, so there is no need of any kind of housing.

Higher adaptability and power density

This Power Station is now more versatile, as it presents only three elements: the first solar inverter, the pad-mounted transformer and the second inverter that features the auxiliary services panel and the auxiliary services transformer installed on top of the same steel base frame. Moreover, it features a great power density: 492 kW/m³.

Complete accessibility

Thanks to the lack of housing, the inverters and the pad-mounted transformer with the integrated MV protections can have immediate access. Furthermore, the design of the C Series central inverters has been conceived to facilitate maintenance and repair works.

Maximum protection

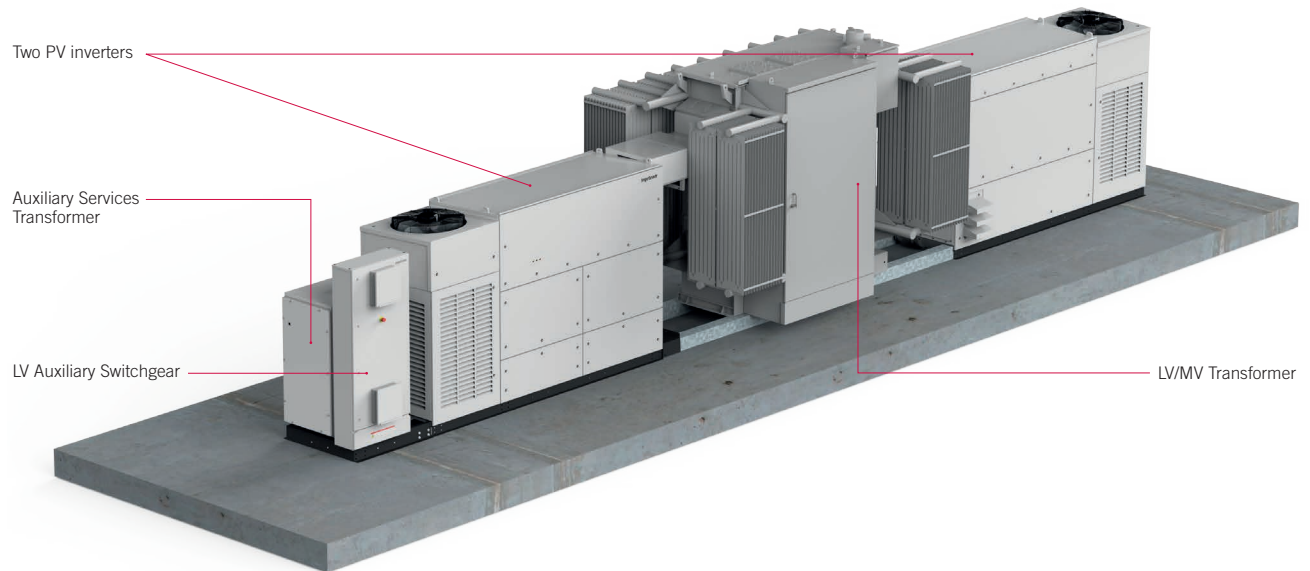
Ingeteam's C Series central inverters integrate the latest generation electronics and a much more efficient electronic protection. Apart from that, they feature the main electrical protections and they deploy grid support functionalities, such as low voltage ride-through capability, reactive power deliverance and active power injection control.

Furthermore, the electrical connection between the inverters and the transformer is fully protected from direct contact.

TURNKEY SOLUTION

for a plug and play on-site installation

COMPONENTS



CONSTRUCTION

- Suitable for slab or piers mounting.
- Compact design, minimizing freight costs.

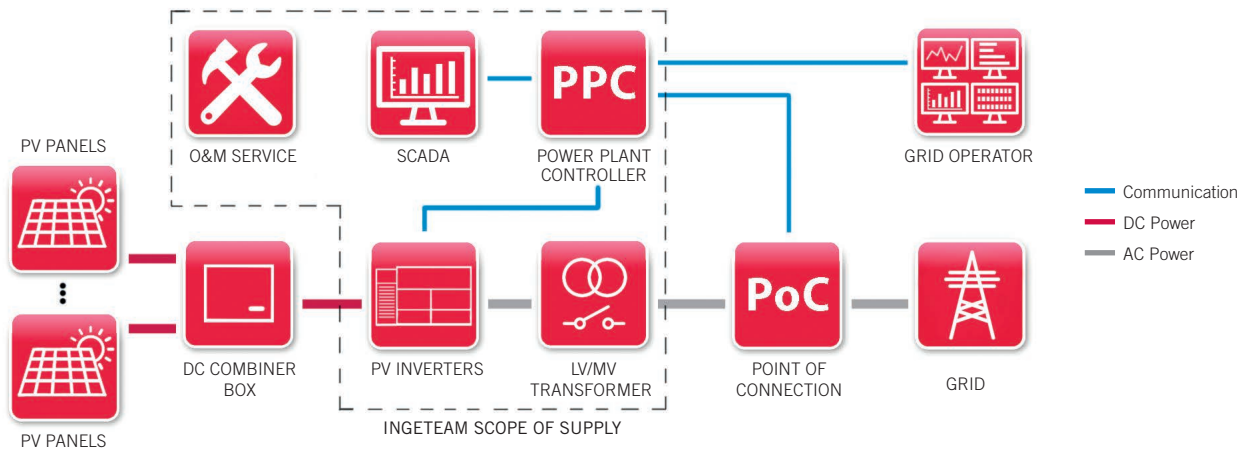
STANDARD EQUIPMENT

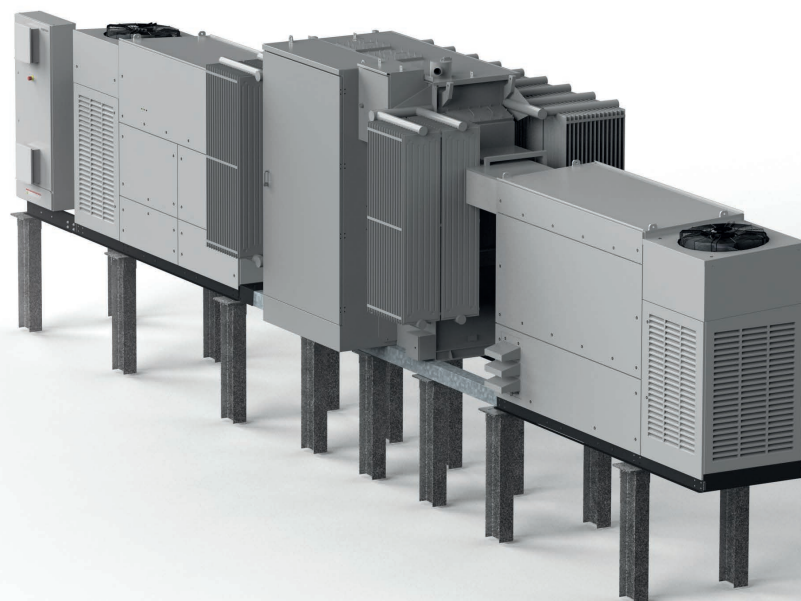
- Up to two inverters with an output power of 7.65 MVA.
- Pad-mounted transformer up to 36 kV.
- Minimum installation at project site.

OPTIONAL ACCESSORIES

- Auxiliary services transformer (up to 50 kVA, Dyn11).
- UPS for monitoring (1.5 kVA, 30 min).
- LV Surge arresters type I+II.
- MV Surge arresters.
- Low voltage distribution panel (IP55).
- Power plant commissioning.
- High-speed Ethernet / fibre optic communication infrastructure for Plug & Play connection to the Power Plant Controller and/or SCADA systems.
- Energy meter for auxiliary services and/or energy production.
- Insulation monitoring relay for continuous monitoring of IS systems insulation.
- Reactive power regulation when there is no PV power available.
- Ground connection of the PV array.

PV PLANT CONFIGURATION



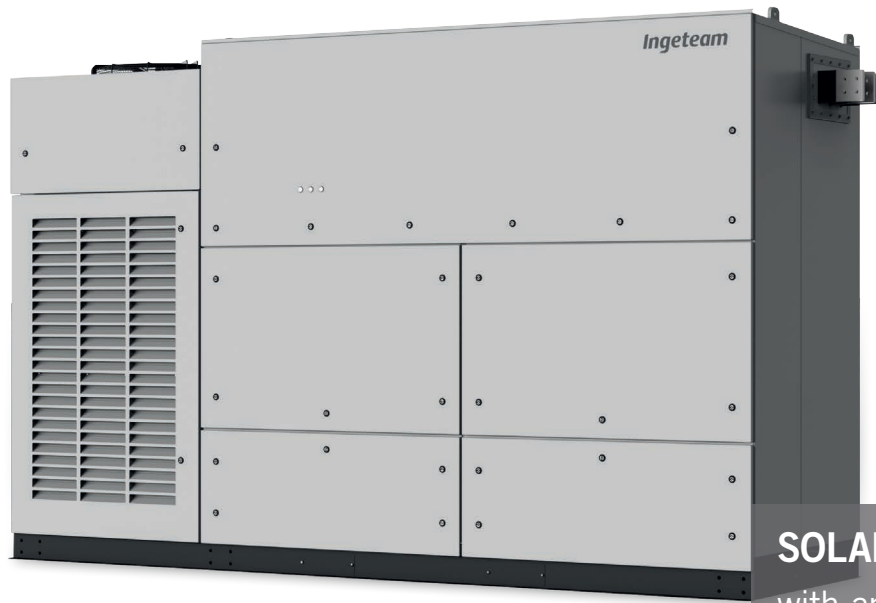


	3825 PMT C Series	7650 PMT C Series
General data		
Number of inverters	1	2
Max. power @30 °C / 86 °F ⁽¹⁾	3,824 kVA	7,648 kVA
Operating temperature range	from -4 °F to +122 °F	
Relative humidity (non-condensing)	0 - 100%	
Maximum altitude	3,000 masl (power derating starting at 1,000 masl)	
LV / MV Transformer		
Standard nominal voltage	34.5 kV	
BIL at standard nominal voltage	200 kV	
Cooling system	KNAN	
Vector group	Dy11	Dd0y11
System impedance	8.5%	
Transformer no load taps	±2.5% & ±5.0%	
MV connection	600 A, dead front, loop feed bushings	
MV fusing	overcurrent protection oil immersed expulsion fuse with ELSP current-limiting backup fuse	
MV disconnect	Two-position, 200 A, under oil load break switch	
Efficiency at 50% load	99%	
Equipment		
Inverters	INGECON® SUN 3Power C Series inverters	
Auxiliary services panel	Standard version (optional monitoring system)	
LV / MV Transformer	Pad-mounted transformer	
Mechanical information		
Dimensions (L x W x H)	9,668 x 2,312 x 2,956 mm	13,175 x 2,312 x 2,956 mm
Standards	IEC 62116, UL1741, IEEE1547, IEEE1547.1, NEC CODE, Electric Rule 21: 2015, CSA22.2 No107	

Notes: ⁽¹⁾ Maximum power calculated with the inverter model INGECON® SUN 3825TL U C690. For other inverter models, please contact Ingeteam's Solar sales department.

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SOLAR INVERTER

with an extra thermal stability and a greater power density

INGECON® SUN 3Power U C Series

This solar photovoltaic inverter provides up to 3,825 kVA in a single power stack

Greater power density

This solar PV inverter achieves a market-leading power density of 492 kVA/m³, as it provides up to 3,825 kVA in just one power stack.

Latest generation electronics

The INGECON® SUN 3Power U C Series PV inverter features an innovative control unit that performs a more efficient and sophisticated inverter control, as it uses a last-generation digital signal processor.

IP65 / NEMA 4 protection

A secondary liquid cooling system is used to refrigerate the air inside the NEMA 4-protected compartment. A water-air heat exchanger is used for that. This compartment contains the power and control electronics, the DC fuses, the DC and AC protections, the busbars and the power phases.

Monitoring and communication

Dual Ethernet to communicate with the SCADA and the PPC (power plant controller). Moreover, it features Wi-Fi communication as access point to connect with the inverter during commissioning and O&M works. Ingeteam's advanced PV plant monitoring system INGECON® SUN Monitor is also available at no extra cost. The Smartphone application of the INGECON® SUN Monitor -available on the App Store and on the Play Store- makes it easier and more comfortable to monitor the PV plant.

Standard 5 year warranty, extendable for up to 25 years.

Advanced grid support



Low Voltage Ride Through



Fast Frequency Regulation



Reactive Power at Night



Voltage Droop Control



Active Power Reserve Without Batteries



Grid Following & Grid Forming



Black Start Capability



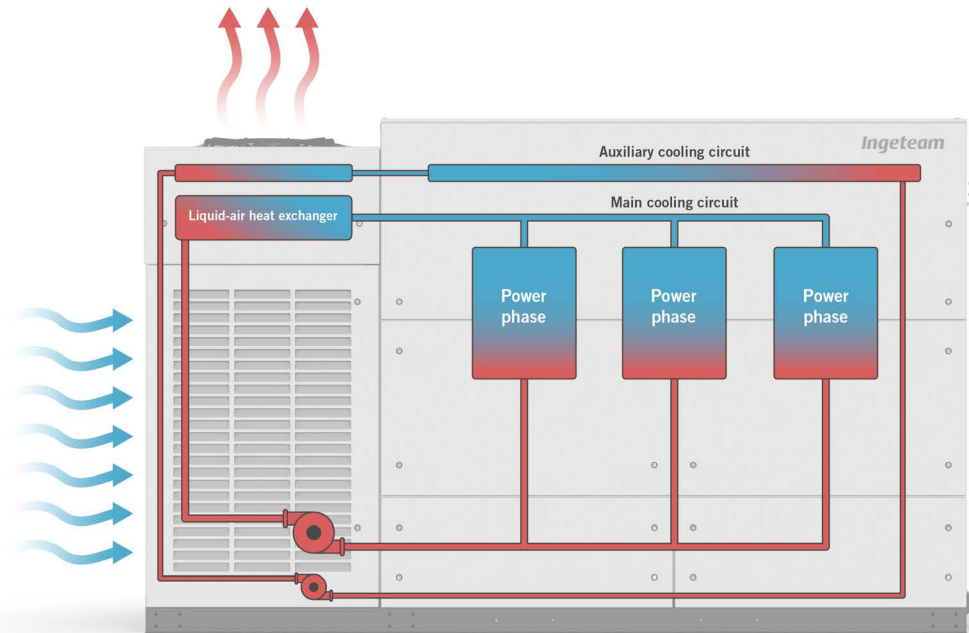
Automatic Voltage Regulation

INGECON® SUN 3825TL U							
	C600	C615	C630	C645	C660	C675	C690
Input (DC)							
Recommended PV array power range ⁽¹⁾	3,144 - 4,188 kWp	3,222 - 4,293 kWp	3,301 - 4,398 kWp	3,379 - 4,502 kWp	3,458 - 4,607 kWp	3,537 - 4,712 kWp	3,615 - 4,816 kWp
Voltage Range MPP ⁽²⁾	857 - 1,300 V	877 - 1,300 V	898 - 1,300 V	919 - 1,300 V	940 - 1,300 V	960 - 1,300 V	981 - 1,300 V
Maximum voltage ⁽³⁾	1,500 V						
Maximum current	3,965 A						
N° inputs with fuse-holders	Up to 24						
Fuse dimensions	630 A / 1,500 V to 500 A / 1,500 V fuses (optional)						
Type of connection	Connection to copper bars						
Power blocks	1						
MPPT	1						
Input protections							
Overvoltage protections	Type II surge arresters (type I+II optional)						
DC switch	Motorized DC load break disconnect						
Other protections	Up to 24 pairs of DC fuses (optional) / Reverse polarity / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton						
Output (AC)							
Power @86 °F / 122 °F	3,326 kVA / 2,858 kVA	3,409 kVA / 2,929 kVA	3,492 kVA / 3,001 kVA	3,575 kVA / 3,072 kVA	3,658 kVA / 3,144 kVA	3,741 kVA / 3,215 kVA	3,824 kVA / 3,287 kVA
Current @86 °F / 122 °F	3,200 A / 2,750 A						
Rated voltage ⁽⁴⁾	600 V IT System	615 V IT System	630 V IT System	645 V IT System	660 V IT System	675 V IT System	690 V IT System
Frequency	60 Hz						
Power Factor ⁽⁵⁾	1						
Power Factor adjustable	Yes, 0 - 1 (leading / lagging)						
THD (Total Harmonic Distortion) ⁽⁶⁾	<3%						
Output protections							
Overvoltage protections	Type II surge arresters (type I+II optional)						
AC breaker	Motorized AC circuit breaker						
Anti-islanding protection	Yes, with automatic disconnection						
Other protections	AC short-circuits and overloads						
Features							
Operating efficiency	98.9%						
CEC	98.5%						
Max. consumption aux. services	9,000 W						
Stand-by or night consumption ⁽⁷⁾	< 180 W						
Average power consumption per day	2,500 W						
General Information							
Ambient temperature	From -4 °F to +140 °F						
Relative humidity (non-condensing)	0-100% (Outdoor)						
Protection class	NEMA 4						
Corrosion protection	External corrosion protection						
Maximum altitude	14,770 ft (for installations beyond 3,300 ft, please contact Ingeteam's solar sales department)						
Cooling system	Liquid cooling system and forced air cooling system with temperature control (400V 3 phase + neutral power supply, 50/60 Hz)						
Air flow range	0 - 78 ft³/s (0 - 7,800 m³/h)						
Average air flow	42 ft³/s (4,200 m³/h per power block)						
Acoustic emission (100% / 50% load)	57 dB(A) at 33 ft / 49.7 dB(A) at 33 ft						
Marking	CE, SGS						
EMC and security standards	UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2, CSA22.2 No107						
Grid connection standards	IEC 62116, UL1741, IEEE1547, IEEE1547.1, NEC CODE, Electric Rule 21: 2015, CSA22.2 No107						

Notes: ⁽¹⁾ Depending on the type of installation and geographical location. Data for STC conditions. ⁽²⁾ Vmp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) and floating systems
⁽³⁾ Consider the voltage increase of the 'Voc' at low temperatures ⁽⁴⁾ Other AC voltages and powers available upon request ⁽⁵⁾ For P_{out}>25% of the rated power ⁽⁶⁾ For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 ⁽⁷⁾ Consumption from PV field when there is PV power available.

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Liquid Cooling System (LCS)

Ingeteam has already supplied +52 GW of liquid-cooled wind power converters worldwide. It offers a greater thermal stability and a more optimized component usage. The LCS has been designed to refrigerate the IGBTs, the power phases and the IP65 / NEMA 4 compartment. It features less moving components, so it consumes a lower amount of power and it requires less maintenance works.

The LCS is a closed circuit supplied totally filled and purged, equipped with fast connectors with an anti-dripping system, so it offers zero risk of particle entrance. It has been designed to avoid siphons in order to easily purge it if necessary. The coolant used is a biodegradable glycol water mixture. There is no need of emptying the LCS in order to replace the phases, nor the sensors.

PROTECTIONS

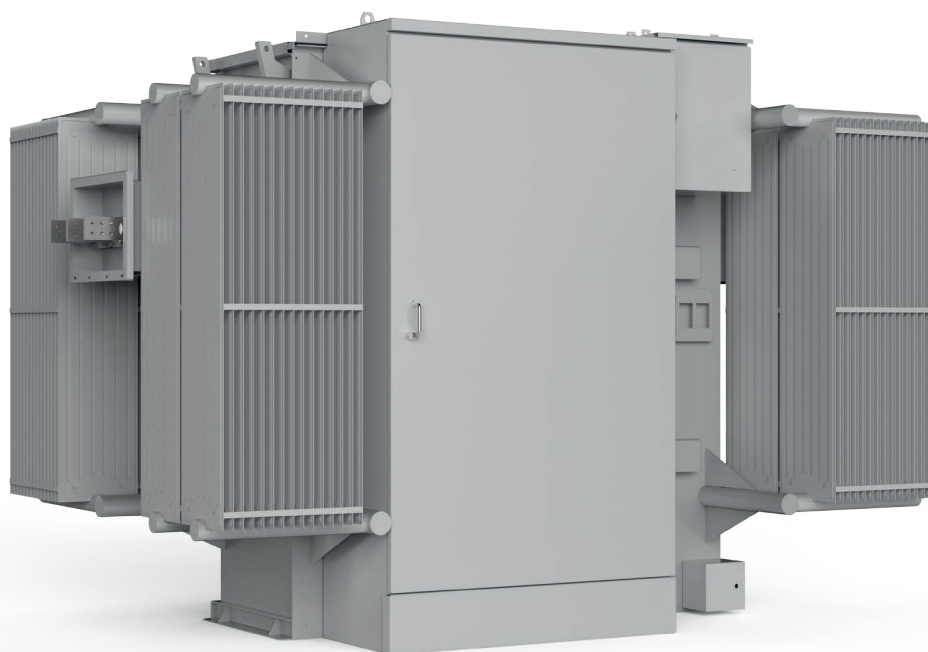
- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation failure DC.
- Up to 24 pairs of fuse-holders.
- Lightning induced DC and AC surge arresters, type II.
- Motorized DC switch to automatically disconnect the inverter from the PV array.
- Motorized AC circuit breaker.
- Hardware protection via firmware.
- Additional protection for the power stack, liquid cooled, IP65 rated and air cooled by a closed loop.

OPTIONAL ACCESSORIES

- Auxiliary services feeder.
- Grounding kit.
- Heating kit, for operating at an ambient temperature of down to -30 °C.
- DC surge arresters type I+II.
- AC surge arresters type I+II.
- DC fuses.
- Monitoring of the currents at the DC input.
- PID prevention kit (PID: Potential Induced Degradation).
- Integrated DC combiner box.

LIQUID COOLING SYSTEM

- LCS to refrigerate the IGBTs.
- More optimized component usage: greater thermal stability.
- Less moving components: lower power consumption and less maintenance works.
- No risk of particle entrance.
- Anti-corrosion protection with stainless steel components.
- LCS is used in many industries. Thus, it is very reliable, as its components are subject to many validation tests.
- Fast connectors with anti-dripping system
- Biodegradable glycol water mixture.
- No need of emptying the LCS in order to replace the phases, nor the sensors.



LV/MV Transformer

Compact transformer for an easy integration with the central inverters

Ingeteam provides highly performing LV / MV three phase oil-insulated type transformers. Power ratings are available up to 7,650 kVA.

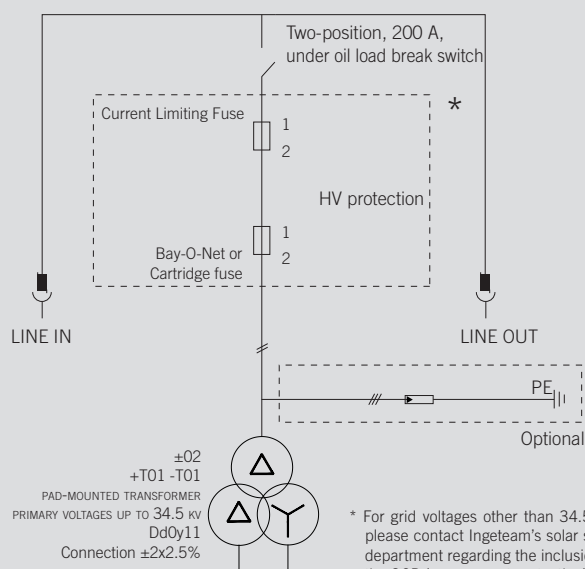
The transformers are classified as per the ANSI IEEE C57.12.34 standard, offering the following benefits:

- Reduced power losses.
- Reduced maintenance needs.
- Suitable both for external use.

STANDARD FUNCTIONS

- Reduced power losses: high efficiencies rated at 50% load.
- Electrostatic shield reducing disturbances, distortions and overvoltages.
- Mineral oil insulation.
- Dead Front Loop Feed arrangement.
- Close-coupled connection.
- Two-position switch rated 200 A for loop configuration.
- Standard temperature and altitude service conditions as per ANSI IEEE C57.12.00.
- Natural ester dielectric insulation fluid (fire point > 300 °C / 572 °F)
- Copper or aluminum windings.
- Other functions available upon request.

LV/MV Transformer



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Auxiliary services panel

The auxiliary services panel is equipped with all the necessary protection and communications elements.

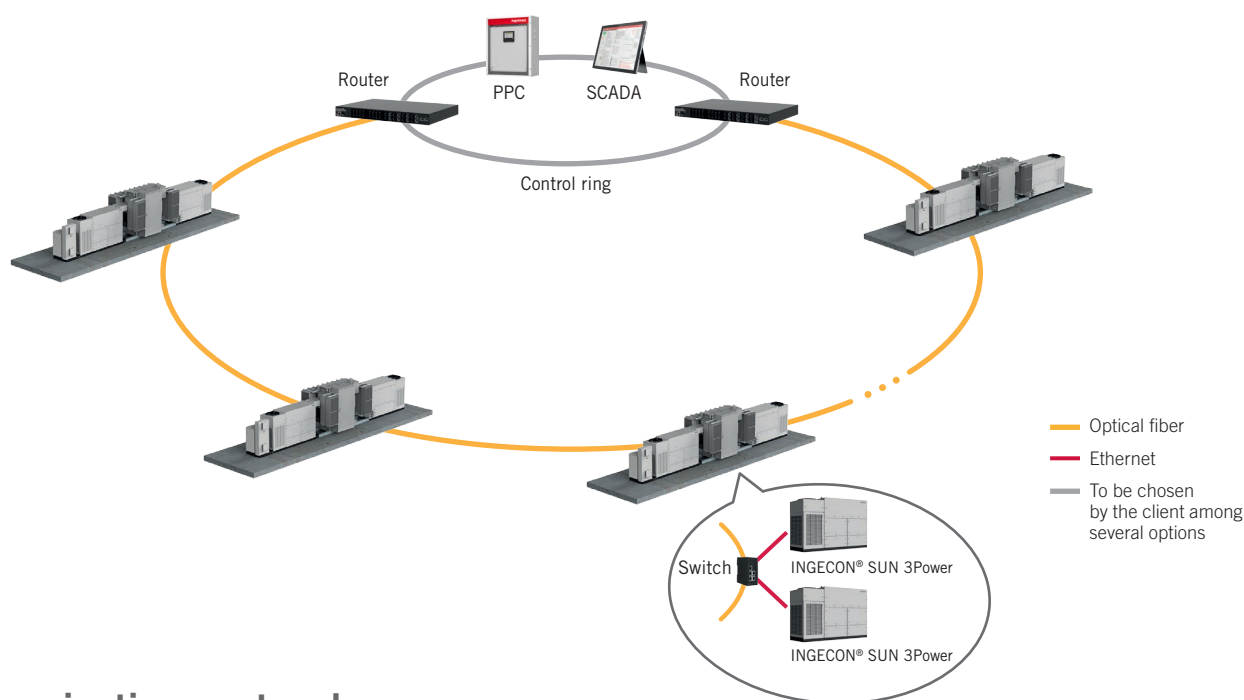
It features an Ingeteam’s remote terminal unit (RTU), INGESYS IC2, with analog and digital inputs, and digital outputs to monitor the status of all the components inside the power station. This RTU is connected to the fiber optic patch panel that is also connected to the power plant controller (PPC) through the plant’s communication network.

Also, this panel integrates type II surge arresters, several circuit breakers and switches.

On the other hand, the auxiliary services panel features a 24-V UPS that guarantees from 10 minutes up to 3 hours of autonomy for the communications.

The power supply for this panel comes from a 30-kVA auxiliary services transformer (Dyn11, IP54), also integrated inside the power station.

Auxiliary services panel	
General information	
Voltage	400 Vac three phase
Auxiliary services transformer	30 kVA
UPS capacity	from 10 minutes up to 3 hours
Ambient temperature	from -20 °C to 50 °C
Relative humidity (non-condensing)	0-100%
Dimensions (W x D x H)	1,000 x 300 x 1,900 mm
Weight	250 kg
Protection class	IP56
Mechanical resistance	IK10
Corrosion protection	C5H
Maximum altitude	2,000 m (for installations beyond 1,000 m, please contact Ingeteam’s solar sales department)
Cooling system	Forced air ventilation
Marking	CE
Remote Terminal Unit (RTU) INGESYS IC2	
Digital inputs	48
Digital outputs	16
Analog inputs	5
Communications	
Modbus TCP RJ45	2 ports
RS-485	Up to 4 ports



Communications network

The communications network is a key factor in order to guarantee a correct solar plant operation. The distribution of the inverters in the communications network depends on many factors, such as the land's variability, the electric connection, the number and rated power of inverters, the distance between them, etc.

In power plants with a high number of inverters, a network's segmentation between different VLANs and a correct configuration of the redundancy protocols in the manageable switches, fiber optic rings, etc., is necessary for optimising the traffic in the network and avoiding overcharges for unnecessary traffic.

Power plant controller

Ingeteam's power plant controller features a control algorithm with response times of less than 10 milliseconds, thanks to which it can develop a precise and effective control of the active and reactive power injected to the grid.

Power plant controller (PPC)	
Communication	
Standard protocols	Modbus / TCP (client and server), FTP (client and server), NTP (client and server)
Compatible protocols	Modbus / RTU (Master and slave), 101 (Slave), 104 (Slave), DNP3 (Slave), OPC UA (Server)
Outer connectivity	10 / 100BaseT(X), 100BaseFX with patch panels
Managed communication	Optional
Redundancy	Optional
General Data	
Dimensions (H/W/D)	1,005 / 860 / 360 mm
Weight	120 kg
Protection class	IP65
Operating temperature	-20 to 50 °C / -4 to 122 °F
Maximum altitude ⁽¹⁾	2,000 m
Marking	CE
Standards	IEC 61000-4-30, IEC 62586-1, IEC 61131-3, IEC 60204-1, IEC 61439
Notes: ⁽¹⁾ For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.	

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