

TURNKEY SOLUTION

for decentralized PV systems
with 1,500 V string inverters

Ingeteam

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- INGECON SUN® 160TL PV INVERTERS
- INGECON SUN® STRING STATION
- AC COMBINER BOX
- LV / MV TRANSFORMER
- MV SWITCHGEAR
- LV-AUX SWITCHGEAR
- AUXILIARY SERVICES TRANSFORMER

INGECON SUN 3Play



INGECON® SUN 160TL

Three-phase transformerless 1,500 V string inverter with the maximum power density

A three-phase inverter family for commercial, industrial and utility-scale PV plants.

Greater cost-effectiveness

Thanks to its greater output power, the new INGECON® SUN 160TL allows to drastically reduce the number of inverters required for designing a PV power plant. Thus, it minimises the labour cost and reduces the global cabling cost. Furthermore, it enables up to a 20% cost reduction in AC cabling as this PV inverter does not require a neutral wire.

Moreover, it does not require DC combiner boxes, nor AC combiner boxes, ensuring the minimum possible CAPEX (Capital Expenditures).

Furthermore, its string inverter philosophy permits an easy and immediate replacement that does not require qualified technicians.

Higher flexibility and power density

The highest flexibility thanks to its maximum DC voltage (1,500 V) and to its wide voltage range MPP (576-1,250 V). Awesome power density, with up to 146.2 kW in a 75 kg inverter.

Rugged design

Aluminium casing, especially conceived for indoor and outdoor applications (IP65). The INGECON® SUN 3Play TL inverters have been designed to guarantee a long life expectancy and to withstand extreme temperatures.

Advanced communications as standard

Thanks to the Wi-Fi communication that this inverter integrates, the power plant can be monitored and controlled without any additional communication cabling. Moreover, it also integrates Ethernet communication. These features, together with the webserver that the inverter integrates, enable a fast and reliable commissioning using a mobile phone, a tablet or a laptop. Furthermore, it is compatible with external Cloud Connect software.

Standard 5 year warranty, extendable for up to 25 years

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INGECON® SUN 160TL

Fully equipped

The 1,500 V series within the INGECON® SUN 3Play inverter family is supplied fully equipped with the main electric protections, aiming to reach the maximum performance with the greatest cost-effectiveness.

Integrated features

Integrated features	STD version	PRO version
DC inputs terminal Block	✓	
PV fast connectors ⁽¹⁾		✓
DC switch	✓	✓
DC surge arresters (type I+II)	✓	✓
AC surge arresters (type II)	✓	✓
DC fuses		✓ ⁽²⁾
Strings current metering kit		✓
Wi-Fi and Ethernet communications	✓	✓

Notes: ⁽¹⁾ No crimping tool needed ⁽²⁾ 32A fuses. Only for the positive pole. Optionally, DC fuses for the negative pole also available.

MAIN FEATURES

- Low-voltage ride-through capability.
- Reactive power capability.
- Compatible with external Cloud Connect software.
- 99.1% maximum efficiency.
- Ethernet and Wi-Fi communications supplied as standard.
- Integrated Webserver.
- Software INGECON® SUN Monitor for PV plant monitoring.
- Suitable for indoor and outdoor installations (IP65).
- High temperature performance.

- Different versions to satisfy every project needs.
- 3 digital inputs and 2 digital outputs.
- DRMO Input Ready (for the Australian market).

PROTECTIONS

- Shortcircuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation faults.
- AC overvoltages with type 2 surge arresters.
- DC overvoltages with type 1+2 surge arresters.
- 32A DC fuses (PRO version).

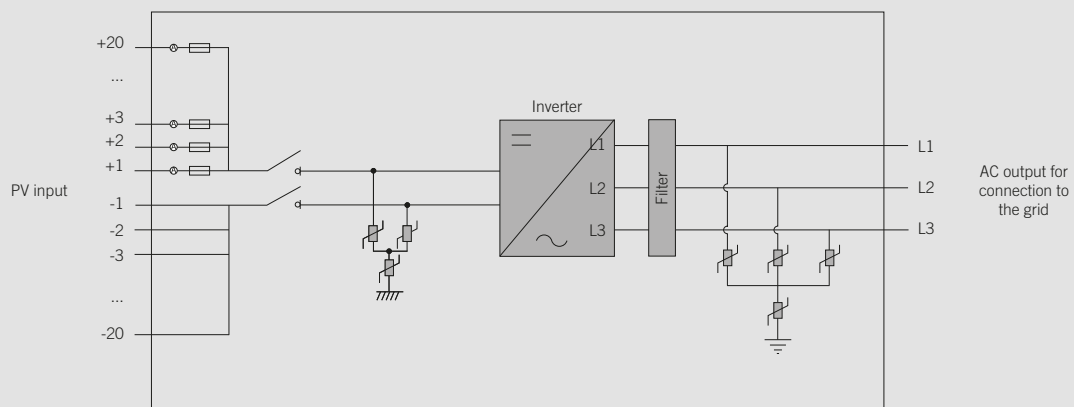
OPTIONAL ACCESSORIES

- Self-consumption kit.
- RS-485 communication.
- DC fuses for the negative pole.
- Compatibility with night power supply.

BENEFITS

- Greater power density.
- Greater cost-effectiveness thanks to the cabling cost reduction.
- High availability compared to central inverters.
- High efficiency rates.
- Easy maintenance.

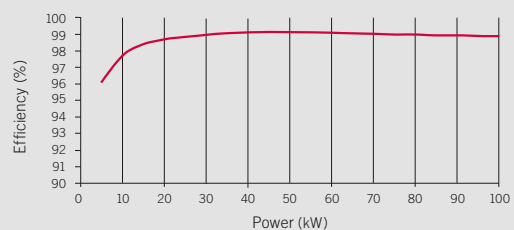
INGECON® SUN 160TL PRO version



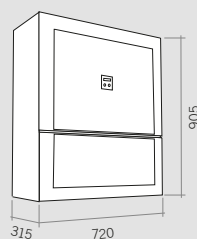
160TL	
Input (DC)	
Recommended PV array power range	148 - 213 kWp
MPP Operating voltage range ⁽¹⁾	908 - 1,250 V
Maximum voltage ⁽²⁾	1,500 V
Maximum current ⁽³⁾	168 A
Short-circuit current	250 A
Inputs (STD / PRO)	1 / 20
MPPT	1
Output (AC)	
Rated power at 25 °C / 40 °C / 50 °C	146.2 kW / 135.3 kW / 132 kW
Maximum current at 25 °C / 40 °C / 50 °C	134 A / 124 A / 121 A
Rated voltage	630 V
Frequency	50 / 60 Hz
Type of grid	IT
Power Factor	1
Power Factor adjustable ⁽⁴⁾	Yes, 0 - 1 (leading / lagging)
THD (Total Harmonic Distortion) ⁽⁵⁾	<3%
Efficiency	
Maximum efficiency	99.1%
Euroefficiency	98.7%
General Information	
Refrigeration system	Forced ventilation
Air flow	570 m ³ /h
Stand-by consumption	20 W
Consumption at night	1 W
Ambient temperature	-25 °C to 60 °C
Relative humidity (non-condensing)	0 - 100%
Protection class	IP65 / NEMA 4
Residual current monitoring unit	Yes
Max. operating altitude	4,000 m
Connection	AC: Max. Cross section: 240 mm ² (one wire). DC connection (PRO): 6 mm ² (20 pairs of PV connectors). Copper and Aluminium cabling permitted for DC and AC
Marking	CE
EMC and safety standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, IEC60068-2-1:2007, IEC60068-2-2:20007, IEC60068-2-14:2009, IEC60068-2-30:2005, IEC62116, IEC61683 and EN50530
Grid connection standards	DIN V VDE V 0126-1-1, Arrêté du 23 avril 2008, EN 50438, EN 50439, EN 50549, CEI 0-21, CEI 0-16 VDE-AR-N 4105:2011-08, G59/3, P.O.12.3, AS4777.2, BDEW, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, Brazilian Grid Code, South African Grid Code, Chilean Grid Code, DEWA 2.0, Jordanian Grid Code, Thailand MEA & PEA requirements

Notes: ⁽¹⁾ $V_{mpp,min}$ is for rated conditions ($V_{ac}=1$ p.u. and Power Factor=1). $V_{mpp,min}$ will depend on the grid voltage (V_{ac}), according to this relation: $V_{mpp,min}=1.44 \cdot V_{ac}$
⁽²⁾ The inverter does not start operating until $V_{dc} < 1,450$ V ⁽³⁾ The maximum current per PV connector is 20 A for the PRO version ⁽⁴⁾ Extended adjustment range for nominal working points ⁽⁵⁾ For rated AC power and voltage in accordance with IEC 61000-3-4 .

Efficiency INGECON® SUN 160TL [630 Vac] $V_{dc} = 1,075$ V



Size and weight (mm)



160TL STD
75 kg.

160TL PRO
78 kg.

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INGECON SUN StringStation



TRANSFORMER STATION

to connect up to 6.4 MW of string inverters to a medium voltage grid.

Maximum compactness and cost-effectiveness

MV solution up to 6.4 MVA

Medium Voltage station for decentralized PV systems with 1,500 V string inverters

MV station designed to connect IngeTeam's three-phase string inverters to a medium voltage grid.

String inverter optimization

The StringStation has been conceived to enable and optimize the use of IngeTeam's INGECON® SUN 160TL inverters at utility scale, ensuring a perfect connection between the PV power plant and the grid. This turnkey solution is capable of connecting up to 6.4 MW of 1,500 V 3Play inverters to a medium voltage grid.

Available worldwide

The INGECON® SUN StringStation can be marketed and installed everywhere in the world, as it is supplied totally integrated and it is easily transportable as a Plug & Play solution.

Equipped with everything necessary

It is supplied with the low-voltage string-inverter protections, auxiliary services, LV / MV transformer and medium-voltage switchgear. Available with high-speed Ethernet or Wi-Fi to communicate with the PV inverters.

Maximum cost-effectiveness

The INGECON® SUN StringStation is a standard solution designed to maximize the compactness and cost-effectiveness of the overall equipment. All the elements are prepared to withstand adverse weather conditions. Moreover, they are supplied pre-connected and pre-integrated into a skid in order to guarantee a Plug & Play installation.

MAIN FEATURES

- Output power up to 6.4 MW at 25 °C.
- Compatible with INGECON® SUN 160TL inverters.
- Available up to 34.5 kV output voltage.
- Available with outdoor-mounted hermetically-sealed LV / MV transformer (up to 6.4 MVA).
- IP54 MV Switchgear.
- Plug & Play solution.
- Maximum reliability, higher safety.
- Reduced maintenance.
- Relative humidity (non-condensing): 0-100%.
- Max. installation altitude: 4,000 meters above sea level.
- UPS for auxiliary services.
- High-speed Ethernet or Wi-Fi to communicate with the PV inverters.

AC COMBINER BOX

- Scalable system thanks to its modular design.
- Circuit breaker up to 1,500 A or 3,000 A, depending on the model of AC Combiner Box.
- 1,500 V DC fuses.
- Forced air ventilation.
- General LV protection with an AC circuit breaker.
- HV surge arresters.

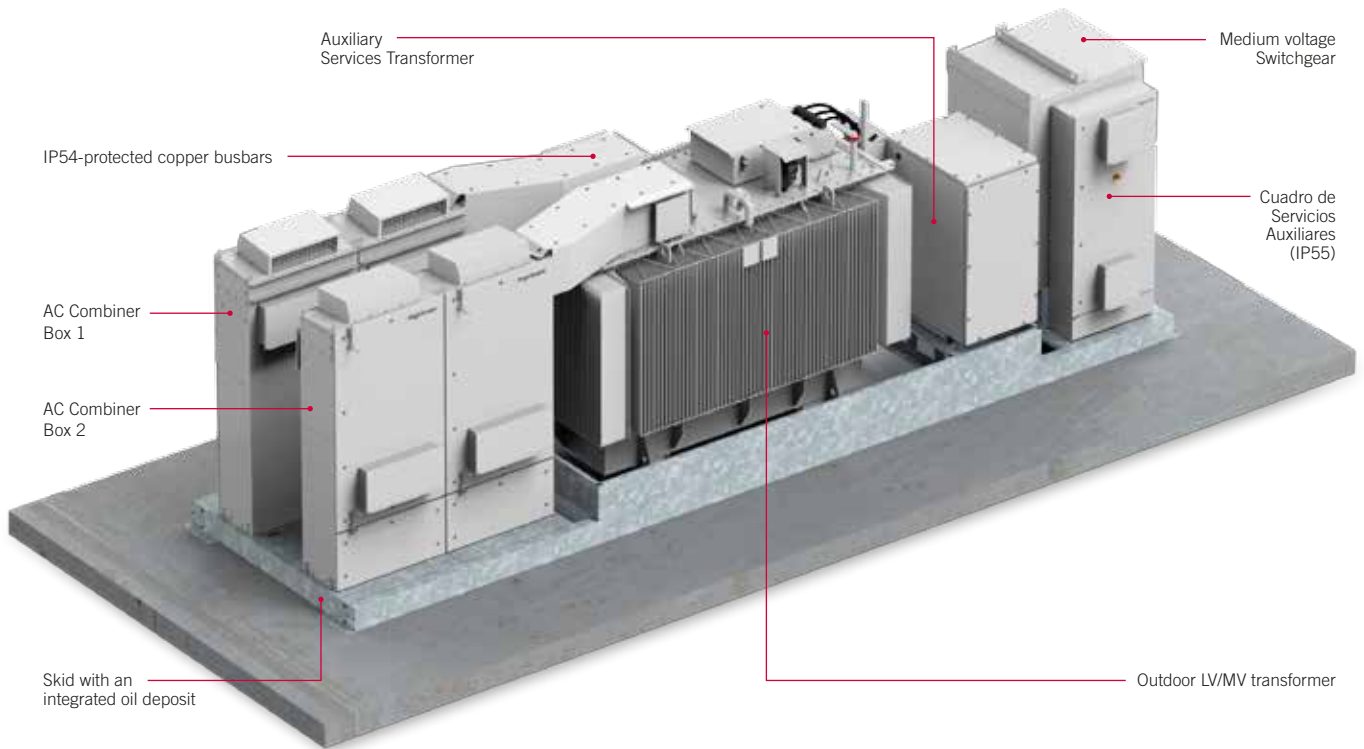
STANDARD MV EQUIPMENT

- LV / MV transformer with reduced power losses.
- 1L1A MV switchgear.
- DGPT2 relay included in the transformer.
- MV protection with circuit breaker.
- Oil deposit integrated in the skid.
- Filtering kit in the oil deposit.

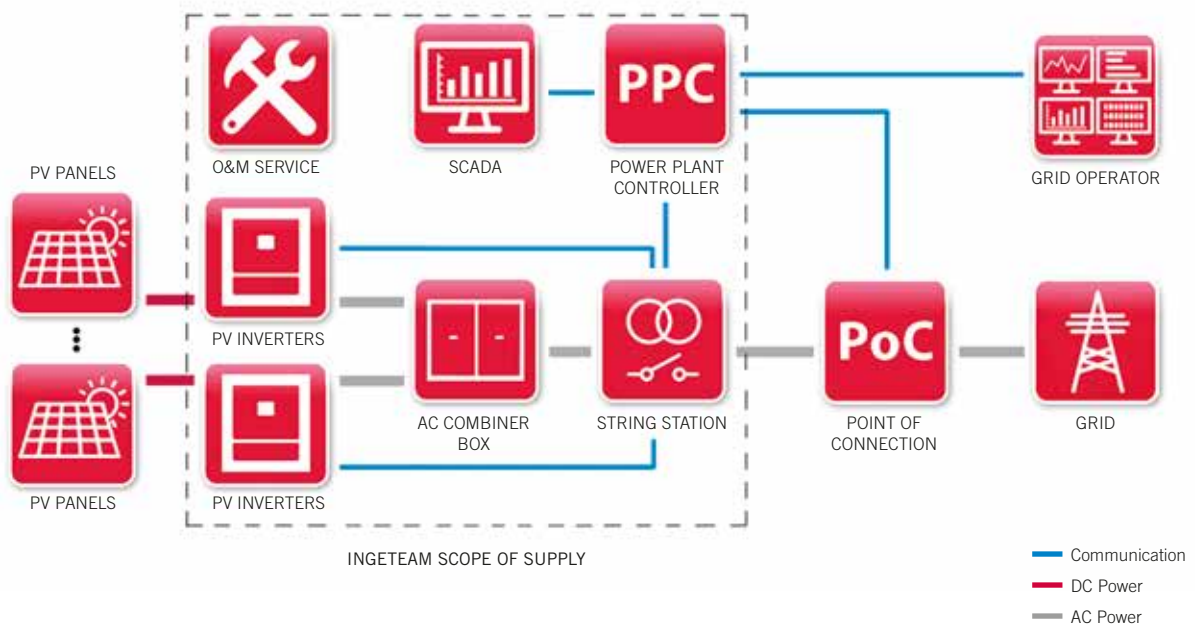
OPTIONAL ACCESSORIES

- 2L1A MV switchgear.

COMPONENTS



PV PLANT CONFIGURATION

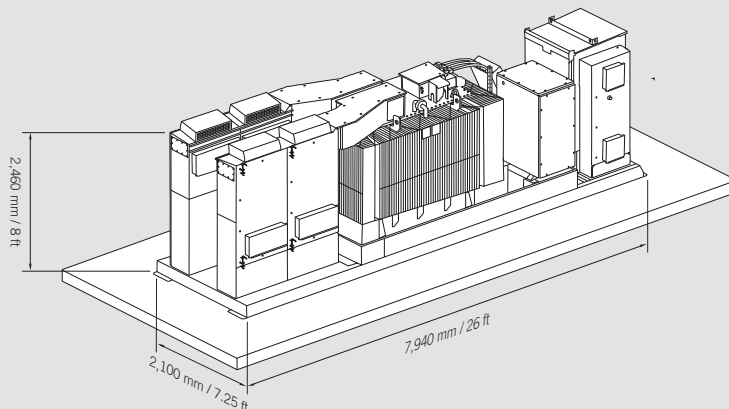


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INGECON® SUN StringStation 1,500 Vdc

	SST 1600	SST 3200	SST 4800	SST 6400
AC Combiner Box				
Model:				
- 1,500 A	✓		✓	
- 3,000 A		✓	✓	✓✓
Rated power at 25 °C / 40 °C / 50 °C	1,608 kW / 1,488 kW / 1,452 kW	3,216 kW / 2,976 kW / 2,904 kW	4,824 kW / 4,464 kW / 4,356 kW	6,432 kW / 5,952 kW / 5,808 kW
Number of inverters	11	22	33	44
AC current at 25 °C / 40 °C / 50 °C	1,474 A / 1,364 A / 1,331 A	2,948 A / 2,728 A / 2,662 A	4,422 A / 4,092 A / 3,993 A	5,896 A / 5,456 A / 5,324 A
AC voltage	630 V			
Frequency	50 / 60 Hz			
Overcurrent protection	Circuit breaker			
AC max. cross section	240 mm ² . One cable per terminal			
Cooling system	Forced air ventilation			
Max. power consumption	750 VA			
Protection degree	IP54			
LV / MV Transformer				
Medium voltage	From 20 kV up to 35 kV, 50-60 Hz			
Cooling system	ONAN			
Max. efficiency	99%			
Protection degree	IP54			
MV Switchgear				
Medium voltage	Up to 35 kV			
Rated current	630 A			
Cooling system	Natural air ventilation			
Max. power consumption	0 W			
Protection degree	IP54			
General data				
Operating temperature range	from -20 °C to +50 °C			
Relative humidity (non-condensing)	0 - 100 %			
Maximum altitude	4,000 masl (power derating starting at 2,000 masl)			
Equipment				
Inverter version	INGECON® SUN 160TL			
LV-AUX Switchgear	Standard version (optional monitoring system)			
LV / MV Transformer	Oil-immersed hermetically sealed transformer			
MV Switchgear	1L1A cells (2L1A optional)			
Mechanical information				
Structure type	Hot dip galvanized steel skid			
Body dimensions	7,940 x 2,100 x 2,460 mm / 26 x 7.25 x 8 ft			
Weight	7,800 kg	11,500 kg	15,500 kg	18,000 kg
Standards	IEC 62271-212, IEC 62271-200, IEC 60076, IEC 61439-1			





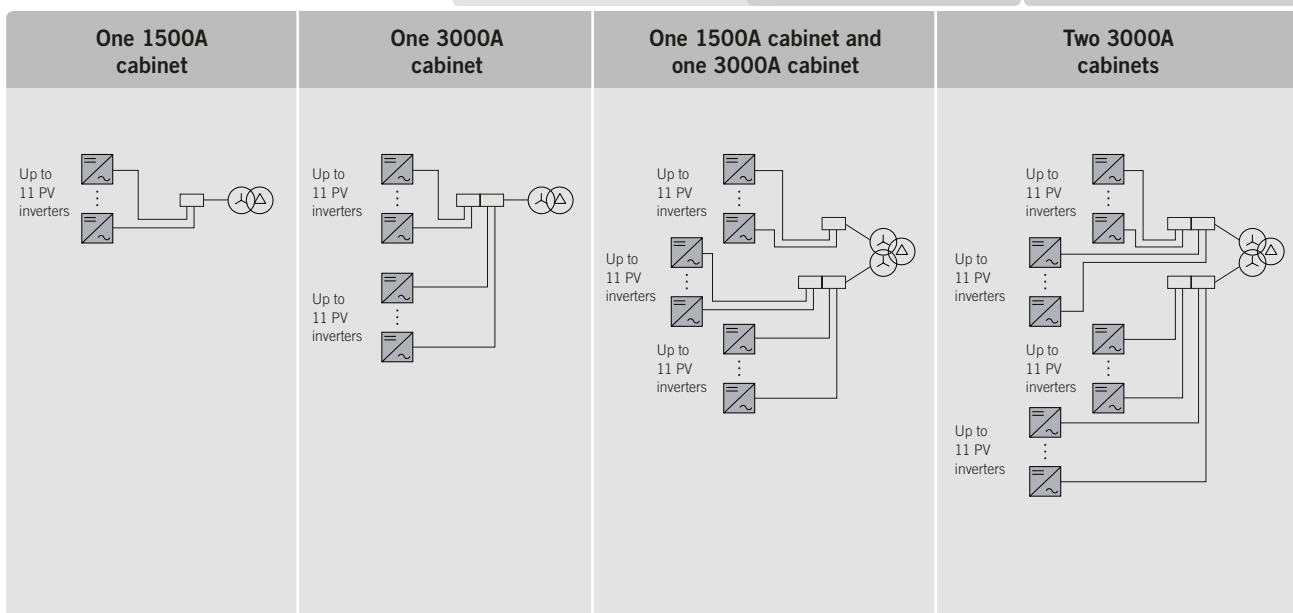
AC Combiner box

These cabinets combine all the AC cabling coming from the solar PV inverters

Ingeteam has designed two models of AC Combiner Box cabinets so that the String Station can be adapted to photovoltaic projects of all sizes.

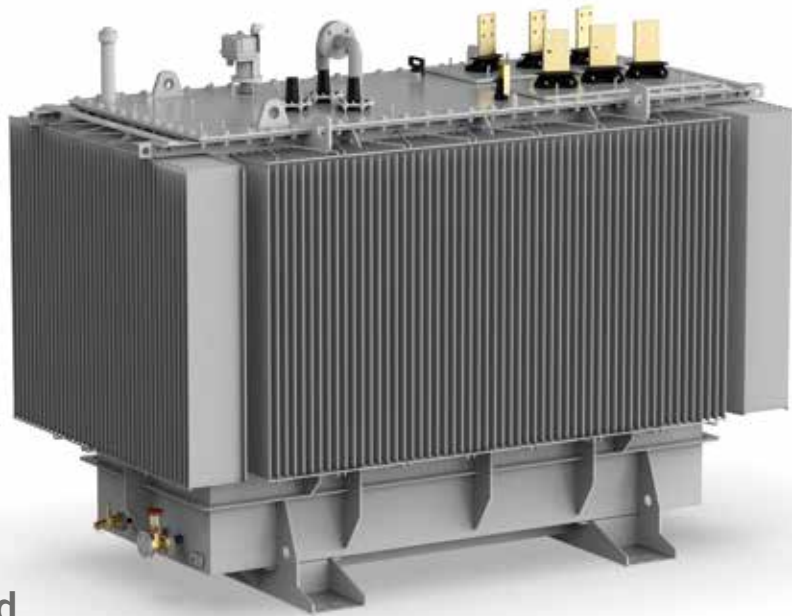
The smallest model is for grouped currents up to 1,500 A. The largest model reaches 3,000 A by combining two 1,500 A cabinets, but with a single output to the LV / MV transformer.

AC Combiner box		
General Information		
AC voltage	630 V	
Frequency	50 / 60Hz	
Overcurrent protection	Circuit breaker	
AC max. cross section	240 mm ² . One cable per terminal	
Cooling system	Forced air ventilation	
Max. power consumption	750 VA	
Protection degree	IP54	
Models	1500A cabinet	3000A cabinet
Number of inverters	11	22
AC current at 25 °C / 40 °C / 50 °C	1.474 A / 1.364 A / 1.331 A	2.948 A / 2.728 A / 2.662 A



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Three-phase oil-insulated LV / MV transformers

Medium Voltage Transformer / Hermetically Sealed Completely Filled

Ingeteam provides highly performing LV / MV three phase oil-insulated type transformers. Power ratings are available up to 7,044 kVA, with voltage ratings (MV side) from 10 up to 36 kV.

The transformers are classified as per the IEC 60076 standard, offering the following benefits:

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

The voltage value at the secondary winding (LV side) is compatible with the inverter output voltage from 400 V to 690 V.

STANDARD FUNCTIONS

- Reduced power losses. Other power losses upon request.
- Electrostatic shield reducing disturbances, distortions and overvoltages.
- DGPT2 / RIS relay.
- Mineral oil insulation.

FUNCTIONS AVAILABLE UPON REQUEST

- Natural ester dielectric insulation fluid (fire point > 300 °C)
- Copper windings.
- Other functions available upon request.

TMV Transformer / Hermetically Sealed Completely Filled

General Information					
Category		Hermetic mineral oil-insulated transformer (vegetable oil insulated upon request)			
Rated frequency		50 / 60Hz			
Efficiency at rated power		99%			
Primary voltage regulator		± 2 x 2.5%			
Insulation class	Primary winding	12 kV: 12 / 28 / 75 kV	17.5 kV: 17.5 / 38 / 95 kV	24 kV: 24 / 50 / 125 kV	36 kV: 36 / 70 / 170 kV
	Secondary winding	3.6 kV			
Primary / secondary conductive material		Aluminium / Aluminium (Copper optional)			
Vector group		Dy11			
Primary connection		Delta ⁽¹⁾			
Secondary connection		Star			
Max. overtemperature for windings / oil		+65 / +60 K			
No load current		< 1%			
Max. peak starting current		< 15 x I _n ⁽¹⁾			
Installation		Indoor or outdoor			
Cooling type		ONAN			
Max. altitude above sea level ⁽²⁾		4,500 m			
Short-circuit impedance at 75 °C		8% ⁽¹⁾			
General features		Terminal board for primary voltage adjustment, lifting lugs, earthing terminal, electrostatic shield and DGPT2 / RIS relay			

Notes: ⁽¹⁾ For different configurations, please contact Ingeteam's solar sales department ⁽²⁾ For installations beyond 1,000 m, please contact Ingeteam's solar sales department.



Medium Voltage Switchgear

Different MV gas-insulated switchgear adapted to every customer's needs

Ingeteam offers a number of configuration options for the Medium Voltage feeder, tailored to suit the needs of each specific customer.

In all cases, gas-insulated metal-enclosed switchgear is used, manufactured according to standard IEC 62271-200.

The key technical features, based on the insulation voltage required, are as follows:

TECHNICAL FEATURES

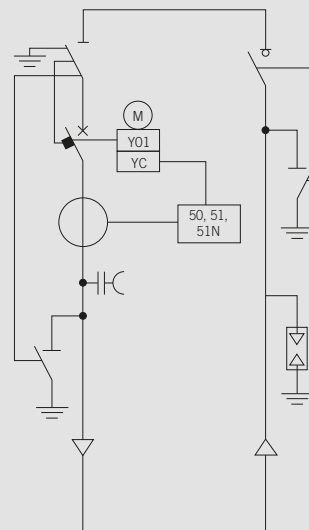
- Breaking capacity 16 kA - 1 s.
- DIN EN 50181 type C plug-in connectors.
- Intrinsically safe operation through interlocks.
- Additional interlocking for transformer room access.
- Optional fused protection available up to 2330 kVA (check climatic conditions).
- Optional circuit breaker protection with 50 / 51 - 50N / 51N function and self-powered protection relay available in the complete power range.
- IP65 for the gas insulated parts.
- Standard Temperature range: from -25 °C to +40 °C.
- Voltage presence indicators and gas pressure display.

	Clase 24 kV	Clase 36 kV
General Information		
Rated Voltage (Ur)	24 kV	36 kV
Rated Insulation level (Ud)	50 kV	70 kV
Rated lighting impulse withstand (Up)	125 kV / 145 kV	170 kV / 195 kV
Rated frequency (fr)	50-60 Hz	50-60 Hz
Rated normal current (Ir) and temperature raise	630 A a 40 °C	630 A a 40 °C
Rated pshot time withstands current (Ip)	16 kA, 20 kA, 25 kA (optional)	16 kA, 20 kA, 25 kA (optional)
Rated peak withstand current (Ip)	40 kA (50 kA opt)→50 Hz 41,6 kA (52 kA opt)→60 Hz	40 kA (50 kA opt)→50 Hz 41,6 kA (52 kA opt)→60 Hz
Rated duration of short-circuit (tk)	1 s (3 s optional)	1 s (3 s optional)
Rated supply voltage of closing and opening devices and of auxiliary and control circuits (Ua)	24 Vdc	24 Vdc
Installation	Outdoor or indoor	Outdoor or indoor

1L1C

Line entry with disconnector and earthing disconnector + transformer position with circuit breaker with 50-51 and 50N-51N protection functions and earthing disconnector.

Typical end of line configuration.





REQUEST
AN OFFER

Ingeteam

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