

REGIONE SICILIA

Provincia di Catania

COMUNE DI RAMACCA





AGROVOLTAICO CONTRADA ALBOSPINO

OGGETTO	PROGETTO DEFINITIVO	34-AGCA-PR-34 CODICE ELABORATO
ELABORATO	SCHEDE TECNICHE PRINCIPALI COMPONENTI	

PROGETTO	IMPIANTO DENOMINATO "AGROVOLTAICO CONTRADA ALBOSPINO", DI POTENZA DI GENERAZIONE PARI A 51,89 MWp, POTENZA IN IMMISSIONE PARI A 50 MW E POTENZA DEL SISTEMA DI ACCUMULO PARI A 10 MW, SITO IN LOCALITA' ALBOSPINO COMUNE DI RAMACCA (CT)
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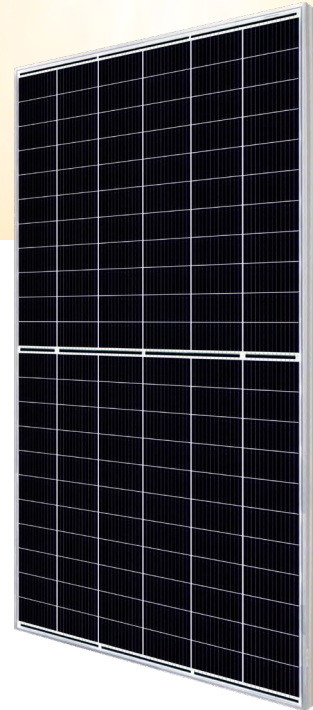
Data	Revisione	Descrizione	Elaborazione	Verifica
Marzo 2022	00	Emissione per procedura di VIA	D.Tomarchio	G.Vicino

PROPONENTE	FRI-EL SOLAR S.r.l. Piazza del Grano 3 - 39100 Bolzano (BZ) P.IVA 02023090380 +39 0471324210 - fri-elsolar@legalmail.it
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PROGETTAZIONE	 E-PRIMA	 E-PRIMA S.R.L. Via Manganelli 20/G - 95030 Nicolosi (CT) tel:095914116 - cell:3339533392 email:info@e-prima.eu
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SCALA:

FORMATO:	A4
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HiKu7 Mono PERC

640 W ~ 670 W

CS7N-640 | 645 | 650 | 655 | 660 | 665 | 670MS

MORE POWER

- Module power up to 670 W
Module efficiency up to 21.6 %
- Up to 3.5 % lower LCOE
Up to 5.7 % lower system cost
- Comprehensive LID / LeTID mitigation technology, up to 50% lower degradation
- Better shading tolerance

MORE RELIABLE

- 40 °C lower hot spot temperature, greatly reduce module failure rate
- Minimizes micro-crack impacts
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa*

12 Years Enhanced Product Warranty on Materials and Workmanship*

25 Years Linear Power Performance Warranty*

**1st year power degradation no more than 2%
Subsequent annual power degradation no more than 0.55%**

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / CE / INMETRO / MCS / UKCA
UL 61730 / IEC 61701 / IEC 62716 / IEC 60068-2-68
UNI 9177 Reaction to Fire: Class 1 / Take-e-way



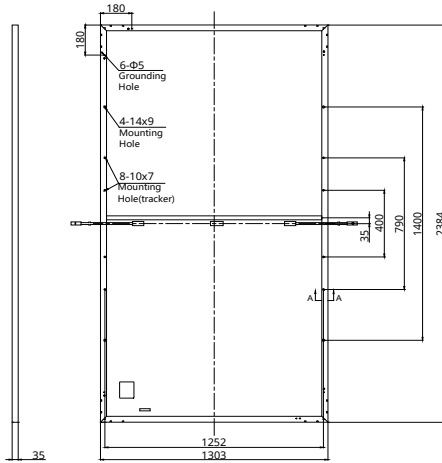
* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

CSI Solar Co., Ltd. is committed to providing high quality solar photovoltaic modules, solar energy and battery storage solutions to customers. The company was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey. Over the past 20 years, it has successfully delivered over 63 GW of premium-quality solar modules across the world.

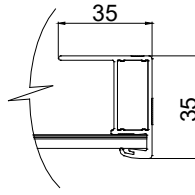
* For detailed information, please refer to the Installation Manual.

ENGINEERING DRAWING (mm)

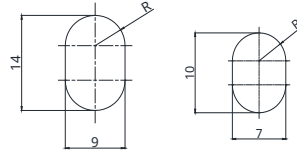
Rear View



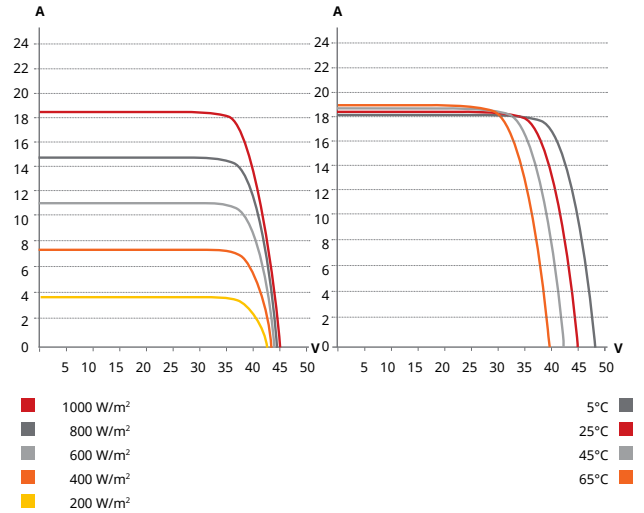
Frame Cross Section A-A



Mounting Hole



CS7N-650MS / I-V CURVES



ELECTRICAL DATA | STC*

CS7N	640MS	645MS	650MS	655MS	660MS	665MS	670MS
Nominal Max. Power (Pmax)	640 W	645 W	650 W	655 W	660 W	665 W	670 W
Opt. Operating Voltage (Vmp)	37.5 V	37.7 V	37.9 V	38.1 V	38.3 V	38.5 V	38.7 V
Opt. Operating Current (Imp)	17.07 A	17.11 A	17.16 A	17.20 A	17.24 A	17.28 A	17.32 A
Open Circuit Voltage (Voc)	44.6 V	44.8 V	45.0 V	45.2 V	45.4 V	45.6 V	45.8 V
Short Circuit Current (Isc)	18.31 A	18.35 A	18.39 A	18.43 A	18.47 A	18.51 A	18.55 A
Module Efficiency	20.6%	20.8%	20.9%	21.1%	21.2%	21.4%	21.6%
Operating Temperature	-40°C ~ +85°C						
Max. System Voltage	1500V (IEC/UL) or 1000V (IEC/UL)						
Module Fire Performance	TYPE 1 (UL 61730 1500V) or TYPE 2 (UL 61730 1000V) or CLASS C (IEC 61730)						
Max. Series Fuse Rating	30 A						
Application Classification	Class A						
Power Tolerance	0 ~ +10 W						

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS7N	640MS	645MS	650MS	655MS	660MS	665MS	670MS
Nominal Max. Power (Pmax)	480 W	484 W	487 W	491 W	495 W	499 W	502 W
Opt. Operating Voltage (Vmp)	35.2 V	35.3 V	35.5 V	35.7 V	35.9 V	36.1 V	36.3 V
Opt. Operating Current (Imp)	13.64 A	13.72 A	13.74 A	13.76 A	13.79 A	13.83 A	13.85 A
Open Circuit Voltage (Voc)	42.2 V	42.3 V	42.5 V	42.7 V	42.9 V	43.1 V	43.3 V
Short Circuit Current (Isc)	14.77 A	14.80 A	14.83 A	14.86 A	14.89 A	14.93 A	14.96 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

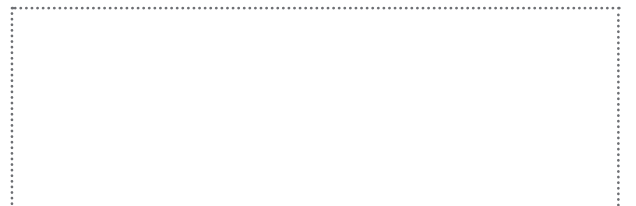
Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	132 [2 x (11 x 6)]
Dimensions	2384 x 1303 x 35 mm (93.9 x 51.3 x 1.38 in)
Weight	34.4 kg (75.8 lbs)
Front Cover	3.2 mm tempered glass with anti-reflective coating
Frame	Anodized aluminium alloy, crossbar enhanced
J-Box	IP68, 3 bypass diodes
Cable	4 mm ² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	460 mm (18.1 in) (+) / 340 mm (13.4 in) (-) or customized length*
Connector	T4 series or MC4-EVO2
Per Pallet	31 pieces
Per Container (40' HQ)	527 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.34 % / °C
Temperature Coefficient (Voc)	-0.26 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	41 ± 3°C

PARTNER SECTION



* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice. Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

CSI Solar Co., Ltd.

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**THREE-PHASE
TRANSFORMERLESS
BATTERY INVERTER
WITH AN EXTRA
THERMAL STABILITY
AND A GREATER
POWER DENSITY**

Up to 3.66 MVA at 1,500 V

The INGECON® SUN STORAGE 3Power C Series is a three-phase bidirectional battery inverter that can be used in grid-connected and stand-alone systems. This one-of-a-kind battery inverter achieves a market-leading power density of 470 kW/m³, as it provides up to 3,660 kVA in just one power stack.

Latest generation electronics

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

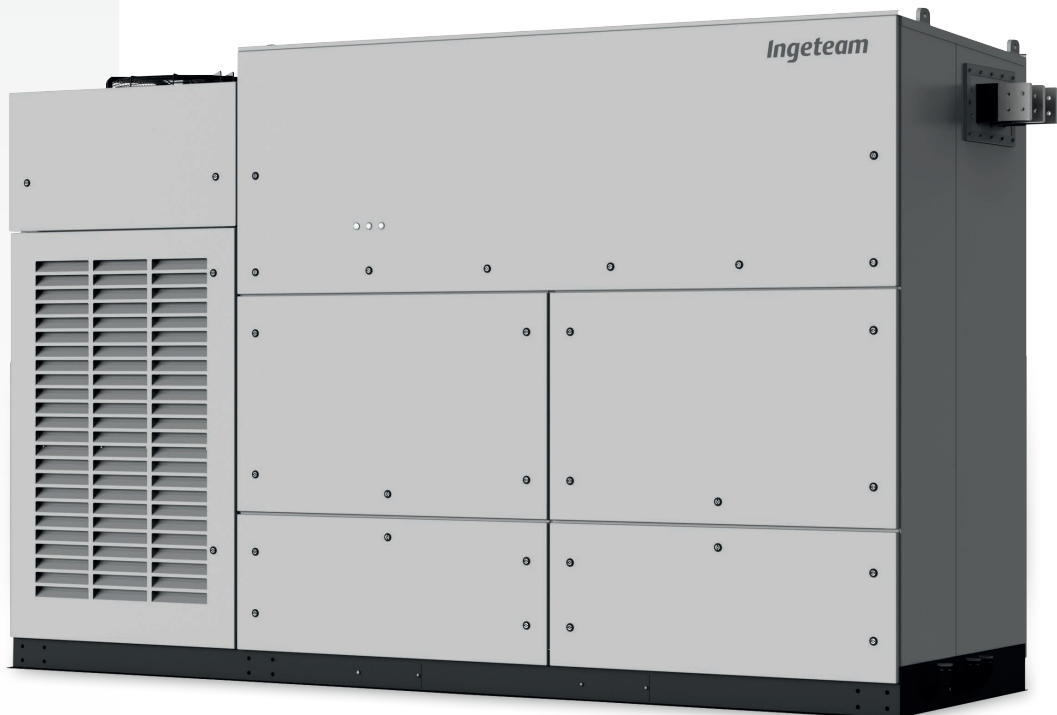
Liquid Cooling System (LCS)

Ingeteam has already supplied +52GW 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 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.

IP65 protection

A secondary liquid cooling system is used to refrigerate the air inside the IP65-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.



Power converter stands both, grid-following and grid forming operating modes:

Real power related functionalities

- Renewable resources integration:
 - Ramp limits.
 - Power smoothing / firming / curtailment.
 - Time shifting.
 - Micro grids.
- Grid support / Ancillary services:
 - Frequency regulation.
 - Synthetic inertia.
 - Black start.
 - Frequency control / protection.
 - Virtual “Synchronous Machine”.

- Investment deferral:
 - Peak shaving.
 - Load shifting / Load following.
 - Real power response improvement of conventional power plants.
- Power efficiency:
 - Time shifting.
 - Price arbitrage.
 - Real power response improvement of conventional power plants.
 - Peak shaving.

- Safety and quality:
 - “Un-interruptible” Power.
 - Grid code compliance.
 - Transmission congestion relief / Power quality - reliability.

Reactive power related functionalities

- Voltage control (Q/V).
- Voltage control / protection.
- Fixed power factor (QPF).
- Fixed reactive power output (Qref).
- Limitation of response of Reactive Power.

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

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.
- 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.

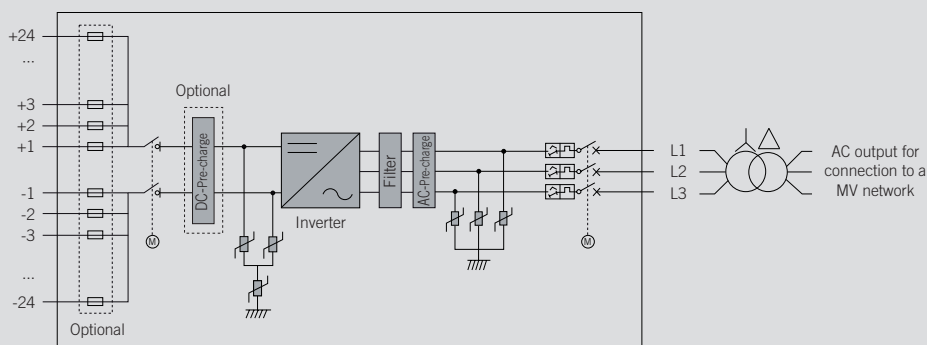
OPTIONAL ACCESSORIES

- 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 DC currents.
- Grounding kit.

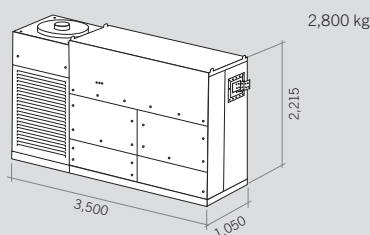
LIQUID COOLING SYSTEM

- 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.

INGECON® SUN STORAGE 3660TL



Size and weight (mm and kg)



INGECON® SUN STORAGE 3660TL							
	C366	C450	C578	C600	C630	C645	C660
Input (DC)							
Battery voltage range for off-grid mode	535 - 1,300 V	650 - 1,300 V	826 - 1,300 V	857 - 1,300 V	898 - 1,300 V	919 - 1,300 V	940 - 1,300 V
Battery voltage for grid-tied mode ⁽¹⁾	579 - 1,300 V	707 - 1,300 V	902 - 1,300 V	936 - 1,300 V	982 - 1,300 V	1,005 - 1,300 V	1,028 - 1,300 V
Maximum voltage ⁽²⁾	1,500 V						
Maximum current	3,850 A						
N° inputs with fuse-holders	Up to 24						
Fuse dimensions	Up to 63 A / 1,500 V / aR / 100 kA (L/R 5mS) (optional)						
Type of connection	Connection to copper bars						
Power blocks	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 @35 °C / @50 °C	2,028.6 kVA / 1,743.3 kVA	2,494.2 kVA / 2,143.4 kVA	3,203.7 kVA / 2,753.1 kVA	3,325.6 kVA / 2,857.9 kVA	3,491.9 kVA / 3,000.8 kVA	3,575 kVA / 3,072.2 kVA	3,658.1 kVA / 3,143.7 kVA
Current @35 °C / @50 °C	3,200 A / 2,750 A						
Rated voltage ⁽³⁾	366 V IT System	450 V IT System	578 V IT System	600 V IT System	630 V IT System	645 V IT System	660 V IT System
Frequency	50 / 60 Hz						
Power Factor ⁽⁴⁾	1						
Power Factor adjustable	Yes, 0 - 1 (leading / lagging)						
THD (Total Harmonic Distortion) ⁽⁵⁾	<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 ⁽⁶⁾	< 180 W						
Average power consumption per day	2,500 W						
General Information							
Ambient temperature	-20 °C to +60 °C						
Relative humidity (non-condensing)	0-100% (Outdoor)						
Protection class	IP65						
Corrosion protection	External corrosion protection						
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's BESS 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 - 18,000 m³/h						
Average air flow	12,000 m³/h						
Acoustic emission (100% / 50% load)	<57 dB(A) at 10m / <49.7 dB(A) at 10m						
Marking	CE						
EMC and security standards	IEC 62920, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-4, IEC 61000-3-11, IEC 61000-3-12, IEC 62109-1, IEC 62109-2, EN 50178, FCC Part 15, AS3100						
Grid connection standards	IEC 62116, EN 50530, IEC 61683, EU 631/2016 (EN 50549-2, CEI 0-16, NTS Spain, VDE-AR-N 4120, VDE-AR-N 4110, , Arrêté du 9 juin 2020, Terna A68), G99, South African Grid Code, Mexican Grid code, Chilean Grid Code, Ecuadorian Grid Code, Peruvian Grid Code, IEC61727, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, DEWA (Dubai), Abu Dhabi Grid Code, Jordan Grid Code, Egyptian Grid Code, Saudi Arabia Grid Code, RETIE Colombia, Australian Grid Code						

Notes: ⁽¹⁾ Minimum voltage DC (VDC, min) for V_{grid,max} = 1.1 p.u. and Power Factor=1. If V_{grid,max} is higher than this value, the minimum voltage should be corrected as VDC, min * V_{grid,max} / 1.1. For other DC voltage ranges, please contact Ingeteam's BESS sales department ⁽²⁾ Consider the voltage increase of the 'Voc' at low temperatures ⁽³⁾ Other AC voltages and powers available upon request ⁽⁴⁾ For P_{out}>25% of the rated power ⁽⁵⁾ For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 ⁽⁶⁾ Consumption from Battery.



Ingeteam

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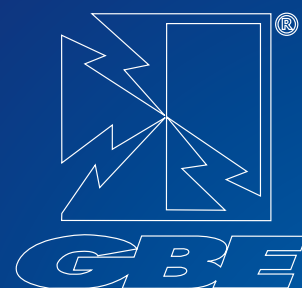
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Trasformatori in olio distribuzione ed esecuzioni speciali

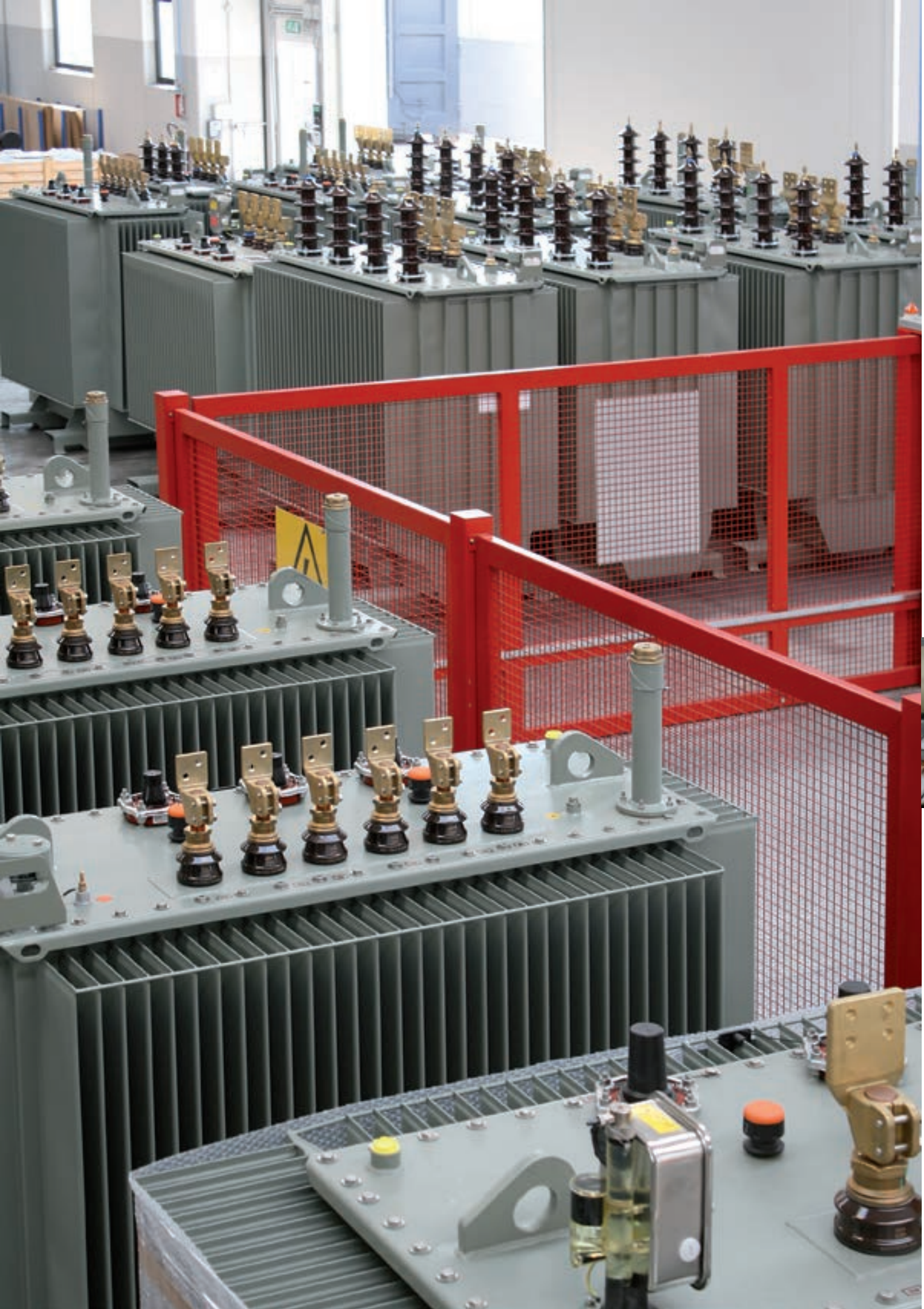
Oil filled transformers
for distribution and special applications



www.gbeonline.com

MADE IN ITALY







La GBE S.p.A. è specializzata nella produzione di trasformatori in olio da 50 kVA fino a 50 MVA, 145 kVA (BIL 650 kV). Inoltre produce reattanze in olio da alcuni kVAR fino a 10 MVAR.

L'esperienza acquisita ci ha permesso finora di risolvere le più svariate richieste anche per unità speciali quali: trasformatori per impianti di conversione a 6-12-18-24-36 pulse, trasformatori di messa a terra con e senza ausiliare, trasformatori per impianti solari con 1-2-3 secondari, trasformatori MT/MT, trasformatori multitemperatura, Trasformatori con olio silconico; MIDEL o FR3. Reattori in olio di corto circuito, limitatrici, spianatrici, filtri, reattori di bassa, media e alta tensione fino a 52 kV.

GBE opera direttamente sul mercato nazionale ed estero e si avvale di 25 anni di esperienza tecnica nel settore. Lo stabilimento di recente costruzione è munito di tutte le attrezzature e macchinari più sofisticati, con processi produttivi automatizzati ed una gestione della produzione in tempo reale tramite codifica delle commesse e bar-code per i materiali.



GBE S.p.A. is specialized in manufacturing of oil filled transformers from 50 kVA up to 50 MVA, 145 kV (BIL 650 kV). Furthermore we offer oil filled reactors from few kVAR up to 10 MVAR.

Our experience in the field has enabled us to solve a wide range of requirements even for special units, i.e. converter transformers with 6-12-18-24-36 pulse, earthling transformers with and without auxiliaries, transformers for solar plants with 1-2-3 secondary windings, HV/HV transformers, multi voltage transformers, transformers with different type of oil: Silicon type, MIDEL, FR3. Shunt reactors, current limiting, damping, tuning (filter), arc-suppression, smoothing reactors, LV/MV/HV reactors up to 52 kV. GBE S.p.A. are present in the national and international market and count on a 25-year technical experience in the field. The recently built new works are equipped with high-tech producing plants, the most sophisticated automation job order systems via real time production management.

Una Realtà Dinamica ed efficiente

A dynamic and efficient team

Mission



In un mondo in continua espansione e sviluppo dove in ogni mercato si deve essere competitivi e dinamici, l'azienda deve dar prova e dimostrazione delle proprie capacità proponendo un prodotto sempre nuovo e che soddisfi pienamente le richieste del mercato.

Fare impresa così come lo intendiamo in GBE, non significa tanto attendere risposte dal mercato, quanto proporsi, capire le esigenze, valutare le necessità e, sempre dalla parte del cliente, offrire più di quanto richiesto, mettendosi continuamente in discussione per poter crescere e migliorare.

GBE desidera dimostrare come non solo il design ma anche la tecnologia italiana possa essere apprezzata in tutto il mondo, qualora la richiesta sia affrontata con serietà, impegno e massima disponibilità di un team unito.



In a continuously expanding and developing world where it is required to be competitive and dynamic in every market, the company shall give evidence of its skills providing constantly state of art products that fulfils the markets' request.

Being in the business as we put it here in GBE does not lie as much in waiting for replies from the market, but rather in proposing themselves, understanding the demands, evaluating the needs and at the customers' side offering more than required by constantly calling themselves into question so to increase and improve.

GBE desire to show how not only the Italian Design but also the Italian Technology could be appreciated worldwide as long as the demand is seriously dealt with commitment and maximum availability to work as a great one-team.

Nucleo magnetico

Magnetic core

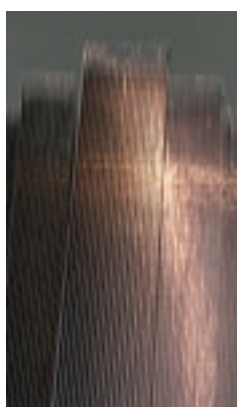
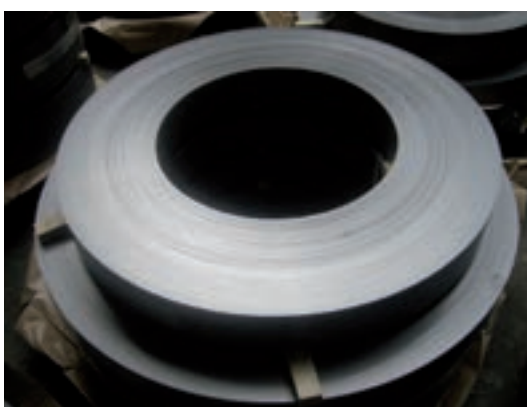


Il nucleo dei trasformatori GBE è costruito con lamierino magnetico a grani orientati ad alta permeabilità magnetica e a perdite specifiche isolati in ambo i lati da un sottile spessore di materiale inorganico (Carlyte).

Il taglio e la composizione è del tipo a 45° a giunti intercalati con metodo "Step-Lap" in modo da ridurre le perdite a vuoto, la corrente a vuoto e la rumorosità del trasformatore. Il numero di gradini e il valore di induzione sono ottimizzati in funzione della potenza del trasformatore. Il serraggio è ottenuto da profili in acciaio zincato opportunamente dimensionati in grado di garantire robustezza e staticità adeguate per tutte le sollecitazioni derivanti dalle operazioni di trasporto e scarico, dagli sforzi elettrodinamici e dalle installazioni più difficili.



GBE transformers cores are obtained from cold rolled grain oriented (CRGO) magnetic steel sheets with highly magnetic permeability and insulated on both sides with a thin layer of inorganic material (Carlyte). The sheet cut and the composition at 45° with "Step Lap" intercalated joints guarantee reduced no-load losses, reduced idling current and low noise level. The number of steps and the magnetic induction are optimized for the power of the transformer. The top and bottom clamps are made by galvanized steel designed as to guarantee the necessary strength for all movements during transport and unloading, electro dynamic stresses and the most difficult installations.





GBE S.p.A. produce trasformatori in olio per tutte le applicazioni, in particolare trasformatori per la distribuzione e speciali con potenza fino a 50 MVA, anche con commutatore sotto carico. Gli avvolgimenti dei trasformatori sono coassiali alle colonne del nucleo e di tipo concentrico. Possono essere realizzati in rame o alluminio con isolamento in classe A o F. Gli avvolgimenti possono presentare dei canali per la circolazione del olio e quindi raffreddamento degli stessi. Questi avvolgimenti sono a sezione ovale o circolare e del tipo concentrico, coassiali alle colonne del nucleo. La cassa dei trasformatori fino a 3150 kVA e del tipo a onde elastiche. Per potenze superiori sono previsti radiatori in lamiera stampata e laminata a freddo. Se previsto i trasformatori sono dotati di normale conservatore per l'espansione dell'olio.

La cassa è protetta dalla vernice idrosolubile RAL 7031 o RAL 7033 con spessore di verniciatura 100-120 micron. Inoltre la GBE S.p.A offre casse personalizzate su richiesta.



GBE S.p.A. produce oil filled transformers for different applications, particularly for distribution and special apply with the power up to 50 MVA, also with unload tap changer. The transformer windings are concentric and coaxial to the core limbs. The windings are made of copper or aluminum with insulation material in class A or F. Channels in the windings guarantee oil circulation and windings optimal cooling.

All transformers up to 3150 kVA are equipped with corrugated tank wall panels. Higher power units use special developed radiators made with cold rolled and laminated steel. All transformers up to 3150 kVA can be filled without conservator.

The outside walls are protected with water resistant paint RAL 7031 or RAL 7033 with painting thickness of minimum 100 micron. Furthermore GBE S.p.A. offer customized tanks in request.



Informazioni generali

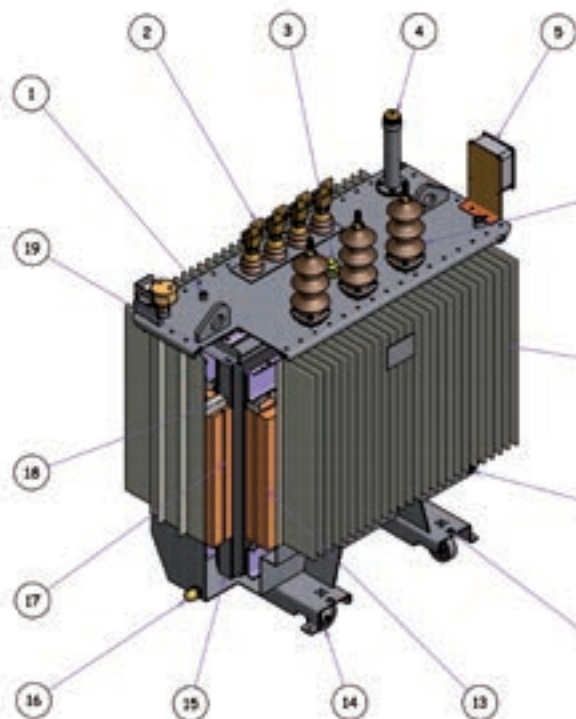
General information



Tutta la produzione è realizzata in conformità alle norme di riferimento europeo CEI, IEC, CENELEC, DIN, BRITISH STANDARD, UNI EN, ISO ed altre. Diverse sono le omologazioni e le certificazioni di prodotto ottenute fino ad ora: RINA, DNV, Lloyd's Register e altri. La GBE è certificata ISO 9001:2008 e ISO 14001.



The whole GBE production is manufactured according to European Standards CEI, IEC, CENELEC, DIN, BRITISH STANDARD, UNI EN, ISO and more. Various are GBE recognitions and certifications such as RINA, DNV, LLOYD'S REGISTER and other naval and marine recognitions. GBE S.p.A. is ISO 9001:2008 and ISO 14001 certified.

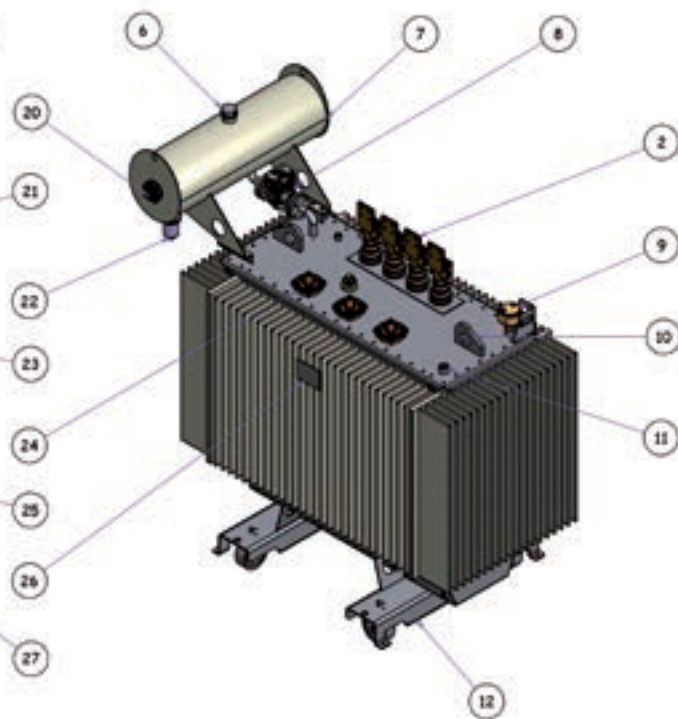


ACCESSORI DEL TRASFORMATORE

- 1 Morsetti di Terra
- 2 Isolatori di Bassa Tensione
- 3 Commutatore regolazione
- 4 Tubo riempimento olio con valvola antiscoppio
- 5 Marshaling Box (su richiesta)
- 6 Tappo riempimento
- 7 Conservatore (se non è ermetico)
- 8 Relè Buchholz
- 9 Termometro a due contatti elettrici (su richiesta)
- 10 Golfari di sollevamento
- 11 Pozzetto termometrico
- 12 Carrello
- 13 Avvolgimento di media tensione
- 14 Ruote orientabili ortogonalmente
- 15 Nucleo
- 16 Valvola di scarico
- 17 Avvolgimenti di Bassa Tensione
- 18 Tappi di pressaggio
- 19 Serrapacchi
- 20 Indicatore del livello olio (se non ermetico)
- 21 Isolatori di Media Tensione
- 22 Silicagel (se non è ermetico)
- 23 Cassa a onde
- 24 Attacchi Elastimold (su richiesta)
- 25 Massa sulla cassa
- 26 Targa con dati tecnici
- 27 Golfari di traslazione

ACCESSORI DI CORREDO SU RICHIESTA

- DGPT2 o RIS (se ermetico)
- Barre passanti per la Bassa Tensione
- Valvola antiscoppio con contatti
- Immagine termica
- Cable box per la bassa e media tensione
- Oil level indicator with contacts (se non ermetico)
- Sonde PT100 per il controllo della temperature di olio (PTO)
- Scaricatori a corno
- Altri (vedi costruttore)



TRANSFORMER ACCESSORIES

- 1 Earthing terminals
- 2 Low Voltage Bushings
- 3 Off load tap changer
- 4 Filling pipe with antibrust valve
- 5 Marshaling Box
- 6 Filling tap
- 7 Conservator (if not hermetic)
- 8 Rele' Buchholz
- 9 Thermometer with two electric contacts (upon request)
- 10 Lifting eyebolts
- 11 Thermometer pocket
- 12 Truck
- 13 Medium Voltage Windings
- 14 Swivelling rollers
- 15 Magnetic Core
- 16 Oil discharge and extraction valve
- 17 Low Voltage Windings
- 18 Pressing Plugs
- 19 Clamps
- 20 Oil level indicator (if not hermetic)
- 21 Medium Voltage Bushings
- 22 Silica gel connection (if not hermetic)
- 23 Tank with waves
- 24 Elastimold (upon request)
- 25 Earthing point on tank
- 26 Name plate
- 27 Movement eyebolts

FURTHER ACCESSORIES AVAILABLE UPON REQUEST

- DGPT2 or RIS (if airtight)
- LV extension bars
- Antibrust valve with contacts
- Thermal image
- Cable box (HV / LV)
- Oil level indicator with contacts (if not hermetic)
- PT100 sensors for oil temperature control (PTO)
- Horn arrestor
- Others (see Manufacturer)



Gli avvolgimenti primari e secondari dei trasformatori in olio sono costruiti in alluminio e/o rame elettrolitico con isolamento dei conduttori in carta di pura cellulosa o per fili di piccolo diametro, in smalto doppio. Questi avvolgimenti sono a sezione ovale o circolare e del tipo concentrico, coassiali alle colonne del nucleo. L'avvolgimento di alta tensione è realizzato in filo o piattina, avvolto ad elica in più strati o a disco continuo in relazione alle tensioni d'esercizio e alla potenza del trasformatore. Avvolgimento di bassa tensione è realizzato in lastra e piattina e presenta i terminali eseguiti in piatto saldato in tutta la lunghezza dell'avvolgimento che ne garantisce la robustezza e resistenza alle sollecitazioni elettrodinamiche. Ogni strato degli avvolgimenti di alta e bassa tensione è isolato con carta di pura cellulosa. Ampi canali, posti tra gli strati degli avvolgimenti, assicurano la circolazione dell'olio ed il necessario raffreddamento. L'isolamento tra alta e bassa tensione e tra questa ed il nucleo è effettuato con cilindri di cartogeno precompresso di spessore adeguato.



The primary and secondary windings are made with electrolytic aluminum or copper, with insulation in pure cellulose paper or in double enamel for wires of small diameter. These windings are oval or circular section and are a concentric type, coaxial to the core columns. The high voltage winding is made with a wire or a metal strip, helically wound with more layers or with continuous disc in relationship to the working voltage and the transformer's power. The low voltage windings are made with foil or strip and are equipped with terminal bars welded along the whole coil length in order to guarantee the correct sturdiness and electro-mechanical stress. Each winding layer of low and medium voltage is insulated with pure cellulose paper, the oil's circulation and necessary cooling are assured by wide channels placed between the windings layers. Insulation between high and low voltage and between the latter and the core is made with compressed cardboard cylinders with a well-sized thickness.

Avvolgimenti di alta e bassa tensione

High voltage & low voltage windings



Commutatori per la regolazione e per variazione della tensione primaria

Tap changers for adjustment or variation of primary voltage



La regolazione e la variazione della tensione primaria è effettuata con commutatori lineari immersi nell'olio e manovrabili a trasformatore disinserito dalla rete mediante manopole poste sul coperchio. Per evitare un errato posizionamento dei commutatori sono previsti dei fori in corrispondenza di ogni tacca di indicazione delle varie posizioni che consentono un sicuro alloggiamento della manopola.

Se richiesto il trasformatore può essere dotato di commutatore a carico che consente la variazione con trasformatore in funzionamento delle tensioni di regolazione.

GBE S.p.A. può realizzare trasformatori con tutte le marche di commutatori presenti sul mercato e fino a basse potenze.



The adjustment or variation of primary voltage is done with linear tap changers in an oil bath and maneuverable with the transformer disconnected from the network by using knobs placed on the cover. To avoid an incorrect positioning of the tap-changers, are foreseen some holes in correspondence with each indication notch of the various positions that allow a secure housing of the knob; in addition, it is possible to apply a padlock to avoid accidental or unauthorized maneuvers.

If required, the transformer may also be equipped with on-load tap changer, which regulates the voltage variation with working (energized) transformer.

GBE S.p.A. offer transformers equipped with any make of on-load tap changer in the market also for small power range.



Isolatori

The insulators



Gli isolatori passanti di alta e bassa tensione sono del tipo per esterno in porcellana smaltata color bruno riempiti d'olio e conformi alla normativa IEC. Gli isolatori sono fissati sul coperchio mediante appositi telai e sono sostituibili senza estrarre il frutto dalla cassa. Gli isolatori di alta tensione su richiesta possono essere muniti di aste spinterometriche. Gli isolatori di alta tensione sono muniti di aste spinterometriche. Gli isolatori possono essere anche in resina per attacco Elastimold oppure passanti. Per tutta la gamma dei prodotti GBE in olio sono state studiate, progettate e sviluppate delle nuove guarnizioni per isolatori per applicazione esterna: da -60°C, -40°C, -25°C fino a 120°C oppure 150°C.



The high and low voltage bushings are oil filled type in enameled brown porcelain according IEC standards. The insulators are fixed on the cover with special frames and may be substituted without removing the core and coil assembly. High voltage bushings may be equipped on request with spark gap rods. The high voltage bushings are provided with spark grip rods. Cast resin insulators suitable for Elastimold type connectors can be delivered upon request.

For the whole range of GBE oil immersed products we have studied, developed and designed new gaskets for outdoor installation bushings that are: from -60°C, -40°C, -25°C up to 120°C or 150°C.



Il riempimento del trasformatore è ottenuto con olio minerale dielettrico esente da PCB, essiccato e degasato, con caratteristiche chimiche ed elettriche conformi alle norme CEI in vigore: il riempimento è effettuato sotto vuoto per la massima tenuta elettrica della rigidità elettrica dell'olio. A richiesta il riempimento può essere effettuato con olio dielettrico di tipo siliconico, MIDEL o FR3.



The filling of the transformers is obtained with mineral oil, without PBC, dried and degassed, with electrical and chemical specifications, which conform to the CEI and IEC standards; the filling is done under-vacuum for the best oil electrical rigidity withstand. If required the tank can be filled with silicon type dielectric oil, MIDEL or FR3.

Liquido isolante

Insulating liquid

Accessori d'uso

Standard accessories



Tutti i trasformatori sono dotati dei seguenti accessori standard:

- Conservatore dell'olio sopra il coperchio (per trasformatori non ermetici)
- Indicatore di livello montato sul conservatore (per trasformatori non ermetici)
- Commutatore a vuoto sopra il coperchio per regolazione della tensione primaria del $\pm 2 \times 2,5\%$
- n°3 isolatori in porcellana lato MT (DIN 42 531)
- n°3 isolatori in porcellana lato BT + n°1 isolatore in porcellana per il neutro (DIN 42530)
- Valvola di riempimento olio
- Valvola di scarico olio (DIN 42 551)
- n°4 ruote di scorrimento orientabili ortogonalmente (DIN 42 561)
- n°1 targa caratteristiche IEC 60076
- Golfari di sollevamento
- n°2 morsetti di terra
- Pozzetto/i termometrico/i (DIN 42 554)



All our transformers are equipped with following standard accessories:

- Oil conservator mounted on the tank top cover (for non hermetically sealed transformers)
- Oil level indicator on the conservator (for non hermetically sealed transformers)
- MV regulation tapplings $\pm 2 \times 2,5\%$ wired to off-circuit tap changing switch with external operating handle
- MV screwed, fully insulated porcelain bushings, 3 off, (DIN 42 531) requirements
- LV Porcelain bushings, 3 off line terminals plus Neutral bushing, (DIN 42530) requirements
- Oil filler cap
- Oil drain valve (DIN 42 551) requirements
- n°4 bi-directional floor rollers (DIN 42 561) requirements
- n°1 rating and name plate (IEC 60076) requirements
- Lifting lugs/eyebolts
- n°2 earthing terminals
- Thermometer pocket in accordance (DIN 42 554)





La cassa dei trasformatori può essere del tipo a onde elastiche oppure con radiatori in lamiera stampata e laminata a freddo. I radiatori sono provati singolarmente prima del loro montaggio. Se previsto i trasformatori sono dotati di normale conservatore per l'espansione dell'olio a caldo. Per trasformatori fino a 4000 KVA è possibile la soluzione a riempimento integrale senza conservatore. Le parti interne delle casse sono protette, previa sabbatura, con speciali vernici insolubili all'olio caldo. Le pareti esterne subiscono un ciclo protettivo con vernice idrosolubile, RAL 7031 o RAL 7033 con spessore di verniciatura 100-120 micron, e sono adatte alle più severe condizioni ambientali.



The transformer tank is available in two versions: corrugated (finned) tank or with radiators, made with cold rolled and laminated steel. All radiators are singularly tested before their assembling. If required the transformer may be supplied with a traditional expansion conservator. All transformers up to 4000 KV can be filled without conservator. The inside walls of tanks are protected, prior to sand blasting, with special paint insoluble to hot oil. The outside walls are protected with water resistant paint RAL 7031 or RAL 7033 with painting thickness of 100-120 micron, suitable to the strictest environmental conditions.

Cassa

The tank



Accessori a richiesta

Accessories upon request



Ove richiesto, è possibile equipaggiare i trasformatori dei seguenti accessori:

- Relè buchholz di protezione a 2 contatti (per trasformatori non ermetici)
- Essiccatore d'aria al silicagel completo di carica sali (per trasformatori non ermetici)
- Presenza contatti per indicatore di livello olio (per trasformatori non ermetici)
- Valvola di sovrappressione (per trasformatori ermetici)
- Sistema di protezione integrato DGPT2 o RIS (per trasformatori ermetici)
- Termometro a quadrante a 2 contatti elettrici
- Cassonetto di protezione IP55 per isolatori BT
- Cassonetto di protezione IP55 per isolatori MT
- Set antivibranti
- Relè di pressione a 2 contatti
- Schermo elettrostatico tra primario e secondario
- Slitte per appoggio su palo



On request following additional accessories can be delivered:

- Gas and oil operated Buchholz relay with 2 electrical contacts
- Dehydrating breather (for non hermetically sealed transformers)
- Oil level indicator contacts on the conservator (for non hermetically sealed transformers)
- Pressure relief valve (hermetically sealed transformers)
- Protection system DGPT2 or RIS (for hermetically sealed transformers)
- Thermometer with 2 electrical contacts
- Protection housing IP 55 for LV bushings
- Protection housing IP 55 for MV bushings
- Antivibration pads for wheels
- Pressure relay with 2 electrical contacts
- Electrostatic screen between primary and secondary voltage
- Skids for pole mounted transformers





Prodotti finiti

Finished products





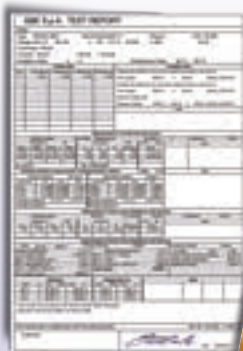
Tutti i trasformatori sono sottoposti presso la nostra sala prove ai collaudi secondo le norme IEC 60076. Sono inoltre corredati di manuale d'uso e manutenzione, bollettino di collaudo, certificato di conformità e disegni d'ingombro. GBE S.p.A. dispone di una sala prove altamente avanzata. Siamo in grado di fare tutte le prove di accettazione, nessuna esclusa. La sala prove dispone di un convertitore 400 A fino a 12000 V con possibilità di variare la frequenza fino a 400 Hz. Inoltre siamo in possesso di uno strumento la prova d'impulso fino a 1.200.000 V. La nostra produzione è certificata secondo le norme ISO 9001:2008 e la ISO 14001:2004.



QUALITÀ DEL PRODOTTO GBE

Tutta la produzione GBE è progettata e costruita in conformità alle seguenti norme:

- IEC 60076;
- EN 50464;
- IEC 61378-1
- EN 50216
- ISO 9001:2008
- ISO 14001:2004



All transformers are tested in our test-room according IEC 60076 norms. All transformers are delivered with maintenance manual, test report, technical drawing and all necessary certifications. the offer to the after sale service. GBE S.p.A. has test room with very high level equipment. We are able to make all acceptance tests, without any exception. Our test room is equipped with special converter 400 A up to 12000V and permits to change the frequency up to 400 Hz. Furthermore there is a impulse test device, which guarantees impulse test range up to 1.200.000 V. All our products are manufactured according to ISO 9001:2008 and ISO 14001:2004.



QUALITY OF GBE PRODUCTS

All our products are designed and manufactured according the following rules:

- IEC 60076;
- EN 50464;
- IEC 61378-1
- EN 50216
- ISO 9001:2008
- ISO 14001:2004



Prove e collaudo

Test reports & witnessed tests

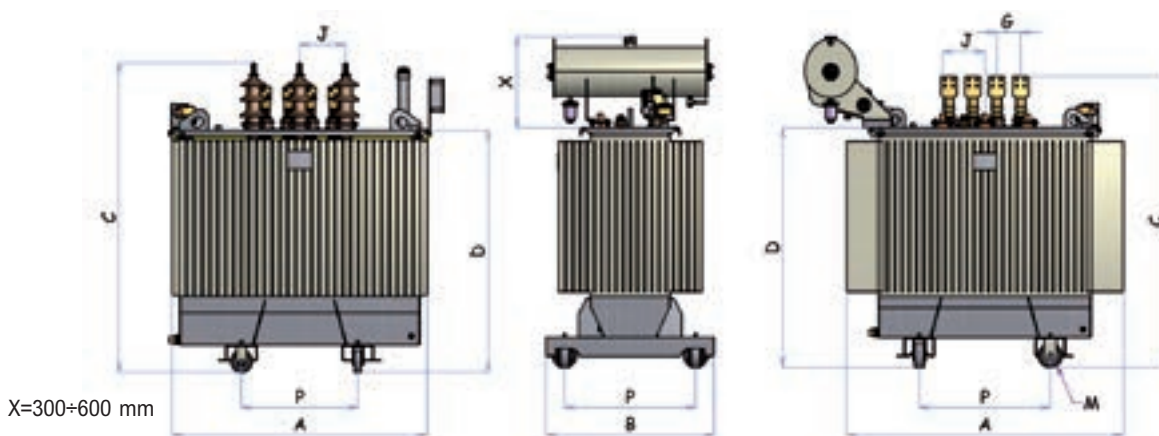
Qualità del prodotto GBE

Quality of GBE products

Scheda tecnica serie EoDk (ex BA') - CoDk (ex BC')

Technical data sheet series EoDk (ex BA')- CoDk (ex BC')

Norme / Standards CEI EN 60076 – CEI EN 50464			
Livello Isolamento MT / Rated Voltage HV	12÷24 kV	Classe Isolamento MT / Insulation Class HV	FI 28÷50 kV BIL 75÷125 kV
Livello Isolamento BT / Rated Voltage LV	1,1 kV	Classe Isolamento BT / Insulation Class LV	FI 3 kV
Frequenza / Frequency	50÷60 Hz	Regolazione MT / Tappings HV	± 4% or ± 2x2,5%



TE3024 - TE3012 - EoDk (ex BA')	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	320	2150	4	59	580	150	1035	720	1365	980	125	520	265	90
160	460	3100	4	62	750	180	1095	730	1445	1060	125	520	265	90	
200	550	3640	4	64	870	240	1165	815	1490	1105	125	520	265	90	
250	650	4200	4	65	1010	230	1225	845	1490	1105	125	520	265	120	
315	770	5000	4	67	1170	260	1255	870	1530	1145	125	670	265	120	
400	930	6000	4	68	1330	300	1255	870	1675	1290	125	670	265	120	
500	1100	7200	4	69	1500	330	1320	870	1675	1290	125	670	265	120	
630	1300	8400	4	70	1780	380	1360	870	1785	1400	125	670	265	130	
630	1200	8700	6	70	1770	430	1455	885	1715	1330	125	670	265	130	
800	1400	10500	6	71	2030	480	1730	885	1785	1400	125	670	265	130	
1000	1700	13000	6	73	2400	550	1810	1110	1870	1485	150	820	265	150	
1250	2100	16000	6	74	2760	620	1850	1110	1950	1565	150	820	265	150	
1600	2600	20000	6	76	3350	790	2020	1110	2015	1630	150	820	265	180	
2000	3100	26000	6	78	4120	950	2170	1380	2190	1805	200	1070	265	180	
2500	3500	32000	6	81	4910	1140	2285	1380	2305	1920	200	1070	265	220	

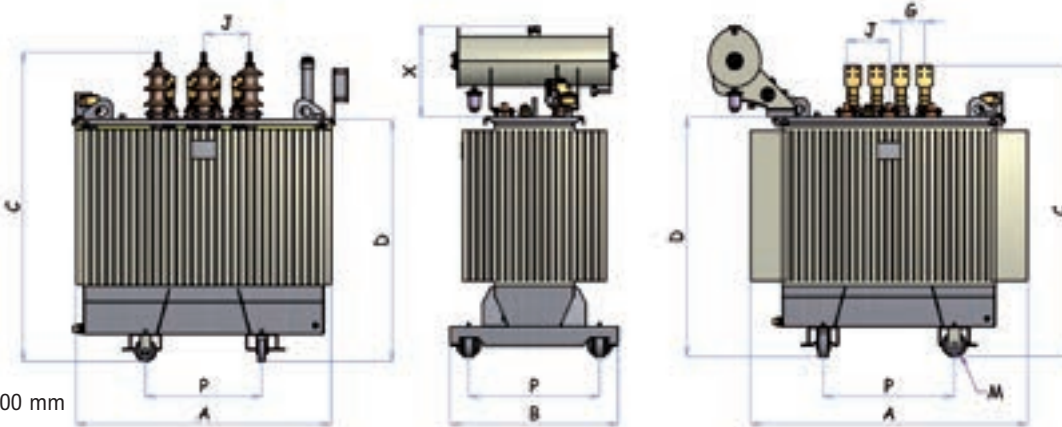
TZ3024 - TZ3012 - CoDk (ex BC')	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	210	2150	4	49	590	140	1035	720	1365	980	125	520	265	90
160	300	3100	4	52	750	180	1095	730	1445	1060	125	520	265	90	
200	370	3640	4	54	880	240	1165	815	1490	1105	125	520	265	90	
250	425	4200	4	55	1020	230	1225	845	1490	1105	125	520	265	120	
315	520	5000	4	57	1190	260	1255	870	1530	1145	125	670	265	120	
400	610	6000	4	58	1340	300	1255	870	1675	1290	125	670	265	120	
500	720	7200	4	59	1520	330	1320	870	1675	1290	125	670	265	120	
630	860	8400	4	60	1790	380	1360	870	1785	1400	125	670	265	130	
630	800	8700	6	60	1780	420	1455	885	1715	1330	125	670	265	130	
800	930	10500	6	61	2050	480	1730	885	1785	1400	125	670	265	130	
1000	1100	13000	6	63	2420	550	1810	1110	1870	1485	150	820	265	150	
1250	1350	16000	6	64	2790	620	1850	1110	1950	1565	150	820	265	150	
1600	1700	20000	6	66	3380	790	2020	1110	2015	1630	150	820	265	180	
2000	2100	26000	6	68	4170	940	2170	1380	2190	1805	200	1070	265	180	
2500	2500	32000	6	71	4960	1140	2285	1380	2305	1920	200	1070	265	220	

Dati e caratteristiche sono indicativi e non impegnativi. La GBE si riserva di comunicare i dati effettivi in fase di offerta.

Characteristic are indicative. GBE will confirm actual data at offer/order stage.

Norme / Standards CEI EN 60076 – CEI EN 50464

Livello Isolamento MT / Rated Voltage HV	12÷24 kV	Classe Isolamento MT / Insulation Class HV	FI 28÷50 kV BIL 75÷125 kV
Livello Isolamento BT / Rated Voltage LV	1,1 kV	Classe Isolamento BT / Insulation Class LV	FI 3 kV
Frequenza / Frequency	50÷60 Hz	Regolazione MT / Tappings HV	± 4% or ± 2x2,5%



X=300+600 mm

TC3024 - TC3012 - EoCk (ex AA')	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	320	1750	4	59	590	140	1005	700	1365	980	125	520	265	90
	160	460	2350	4	62	760	170	1065	710	1445	1060	125	520	265	90
	200	550	2800	4	64	890	230	1130	790	1490	1105	125	520	265	90
	250	650	3250	4	65	1030	220	1190	820	1490	1105	125	520	265	120
	315	770	3900	4	67	1200	250	1220	845	1530	1145	125	670	265	120
	400	930	4600	4	68	1360	290	1220	845	1675	1290	125	670	265	120
	500	1100	5500	4	69	1530	320	1280	845	1675	1290	125	670	265	120
	630	1300	6500	4	70	1810	370	1320	845	1785	1400	125	670	265	130
	630	1200	6750	6	70	1800	410	1415	860	1715	1330	125	670	265	130
	800	1400	8400	6	71	2070	460	1680	860	1785	1400	125	670	265	130
	1000	1700	10500	6	73	2450	540	1755	1080	1870	1485	150	820	265	150
	1250	2100	13500	6	74	2820	610	1795	1080	1950	1565	150	820	265	150
	1600	2600	17000	6	76	3420	770	1960	1080	2015	1630	150	820	265	180
	2000	3100	21000	6	78	4210	920	2105	1340	2190	1805	200	1070	265	180
	2500	3500	26500	6	81	5010	1110	2220	1340	2305	1920	200	1070	265	220
3150	4500	33000	6	84	6280	1380	2495	1410	2390	2105	200	1070	265	265	
4000*	5300	38000	7	86	7410	1700	2680	1495	2390	2105	200	1070	265	265	
5000*	6000	43000	7	88	9030	2190	2885	1565	2470	2085	200	1070	265	265	
6300*	6800	47000	8	90	11020	2640	3090	1625	2585	2200	200	1070	265	265	

TD3024 - TD3012 - CoCk (ex AC')	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	210	1750	4	49	600	140	1005	700	1365	980	125	520	265	90
	160	300	2350	4	52	770	170	1065	710	1445	1060	125	520	265	90
	200	370	2800	4	54	900	230	1130	790	1490	1105	125	520	265	90
	250	425	3250	4	55	1040	220	1190	820	1490	1105	125	520	265	120
	315	520	3900	4	57	1210	250	1220	845	1530	1145	125	670	265	120
	400	610	4600	4	58	1370	290	1220	845	1675	1290	125	670	265	120
	500	720	5500	4	59	1550	320	1280	845	1675	1290	125	670	265	120
	630	860	6500	4	60	1830	370	1320	845	1785	1400	125	670	265	130
	630	800	6750	6	60	1820	410	1415	860	1715	1330	125	670	265	130
	800	930	8400	6	61	2090	460	1680	860	1785	1400	125	670	265	130
	1000	1100	10500	6	63	2470	530	1755	1080	1870	1485	150	820	265	150
	1250	1350	13500	6	64	2850	600	1795	1080	1950	1565	150	820	265	150
	1600	1700	17000	6	66	3450	760	1960	1080	2015	1630	150	820	265	180
	2000	2100	21000	6	68	4250	910	2105	1340	2190	1805	200	1070	265	180
	2500	2500	26500	6	71	5060	1100	2220	1340	2305	1920	200	1070	265	220
3150	3000	33000	6	73	6340	1370	2495	1410	2390	2105	200	1070	265	265	
4000*	3500	38000	7	75	7480	1680	2680	1495	2390	2105	200	1070	265	265	
5000*	3900	43000	7	76	9120	2170	2885	1565	2470	2085	200	1070	265	265	
6300*	4300	47000	8	77	11130	2610	3090	1625	2585	2200	200	1070	265	265	

* solo versione con conservatore/NOT provided on hermetically sealed transformers

Scheda tecnica serie Eock (ex AA') - CoCk (ex AC')
Technical data sheet series Eock (ex AA') - CoCk (ex AC')

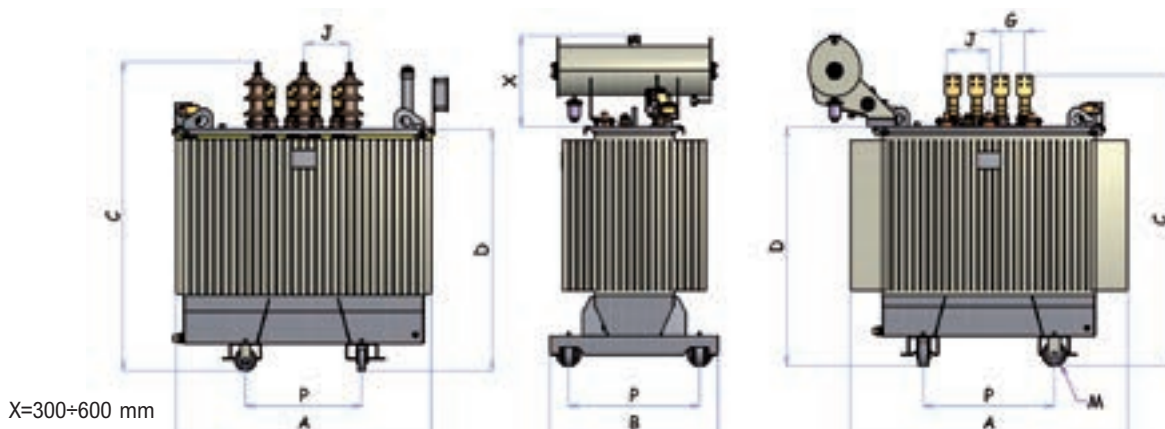
Dati e caratteristiche sono indicativi e non impegnativi. La GBE si riserva di comunicare i dati effettivi in fase di offerta.

Characteristic are indicative. GBE will confirm actual data at offer/order stage.

Scheda tecnica serie Codk (ex CC') - AoBk (ex CC'R)

Technical data sheet series Codk (ex CC') - AoBk (ex CC'R)

Norme / Standards CEI EN 60076 – CEI EN 50464			
Livello Isolamento MT / Rated Voltage HV	12÷24 kV	Classe Isolamento MT / Insulation Class HV	FI 28÷50 kV BIL 75÷125 kV
Livello Isolamento BT / Rated Voltage LV	1,1 kV	Classe Isolamento BT / Insulation Class LV	FI 3 kV
Frequenza / Frequency	50÷60 Hz	Regolazione MT / Tappings HV	± 4% or ± 2x2,5%



X=300+600 mm

TR3024 - TR3012 - CoDk (ex CC')	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	210	1475	4	49	700	170	1065	710	1445	1060	125	520	265	90
160	300	2000	4	52	890	200	1130	725	1490	1105	125	520	265	90	
200	370	2350	4	54	1050	240	1190	735	1590	1205	125	520	265	90	
250	425	2750	4	55	1180	270	1220	740	1635	1250	125	520	265	120	
315	520	3250	4	57	1350	290	1280	845	1635	1250	125	670	265	120	
400	610	3850	4	58	1530	330	1320	845	1715	1330	125	670	265	120	
500	720	4600	4	59	1830	400	1415	895	1715	1330	125	670	265	120	
630	860	5400	4	60	2060	440	1415	925	1870	1485	125	670	265	130	
630	800	5600	6	60	2140	450	1485	920	1830	1445	125	670	265	130	
800	930	7000	6	61	2420	540	1550	915	1830	1445	125	670	265	130	
1000	1100	9000	6	63	2730	580	1550	1080	1950	1565	150	820	265	150	
1250	1350	11000	6	64	2920	630	1815	1080	2015	1630	150	820	265	150	
1600	1700	14000	6	66	3520	770	1905	1080	2105	1720	150	820	265	180	
2000	2100	18000	6	68	4170	890	1995	1340	2190	1805	200	1070	265	180	
2500	2500	22000	6	71	4990	1040	2160	1340	2305	1920	200	1070	265	220	

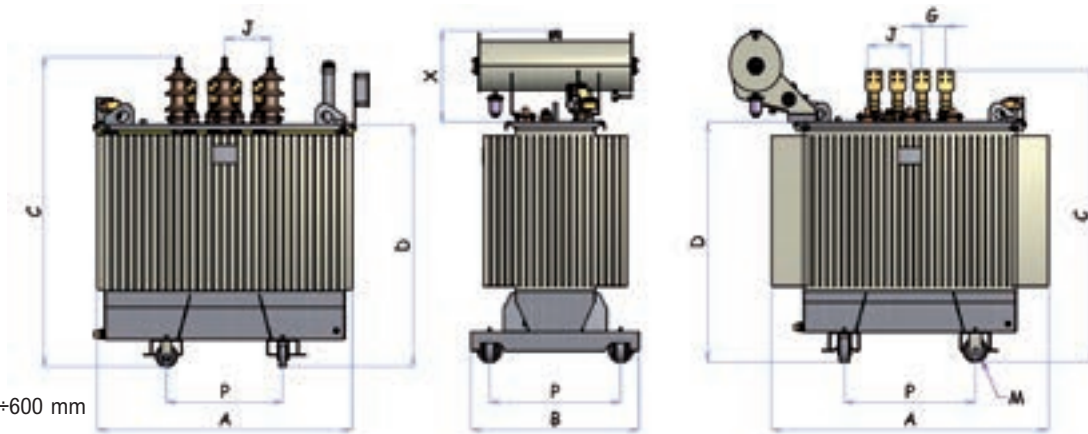
TU3024 - TU3012 - AoBk (ex CC'R)	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	145	1475	4	41	710	170	1065	710	1445	1060	125	520	265	90
160	210	2000	4	44	900	200	1130	725	1490	1105	125	520	265	90	
200	260	2350	4	46	1060	240	1190	735	1590	1205	125	520	265	90	
250	300	2750	4	47	1190	260	1220	740	1635	1250	125	520	265	120	
315	360	3250	4	49	1360	280	1280	845	1635	1250	125	670	265	120	
400	430	3850	4	50	1550	320	1320	845	1715	1330	125	670	265	120	
500	510	4600	4	51	1850	390	1415	895	1715	1330	125	670	265	120	
630	600	5400	4	52	2080	430	1415	925	1870	1485	125	670	265	130	
630	560	5600	6	52	2160	440	1485	920	1830	1445	125	670	265	130	
800	650	7000	6	53	2440	530	1550	915	1830	1445	125	670	265	130	
1000	770	9000	6	55	2760	570	1550	1080	1950	1565	150	820	265	150	
1250	950	11000	6	56	2950	620	1815	1080	2015	1630	150	820	265	150	
1600	1200	14000	6	58	3560	750	1905	1080	2105	1720	150	820	265	180	
2000	1450	18000	6	60	4210	870	1995	1340	2190	1805	200	1070	265	180	
2500	1750	22000	6	63	5040	1020	2160	1340	2305	1920	200	1070	265	220	

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Characteristic are indicative. GBE will confirm actual data at offer/order stage.

Norme / Standards CEI EN 60076 – CEI EN 50464

Livello Isolamento MT / Rated Voltage HV	36 kV	Classe Isolamento MT / Insulation Class HV	FI 28÷50 kV BIL 75÷125 kV
Livello Isolamento BT / Rated Voltage LV	1,1 kV	Classe Isolamento BT / Insulation Class LV	FI 3 kV
Frequenza / Frequency	50÷60 Hz	Regolazione MT / Tappings HV	± 4% or ± 2x2,5%



X=300÷600 mm

TR3036 - CoBk	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	380	1950	4	56	680	180	1085	720	1520	1035	125	520	365	90
	160	520	2550	4	59	860	220	1150	730	1610	1125	125	520	365	90
	200	650	2800	4	61	1010	300	1225	815	1655	1170	125	520	365	90
	250	780	3500	4	62	1170	290	1290	845	1655	1170	125	520	365	120
	315	950	3900	4	64	1360	330	1320	870	1700	1215	125	670	365	120
	400	1120	4900	4	65	1500	370	1295	915	1870	1385	125	670	365	120
	500	1290	5500	4	66	1730	420	1385	870	1865	1380	125	670	365	120
	630	1450	6500	4	67	2100	500	1420	865	1995	1510	125	670	365	130
	800	1700	8400	6	68	2340	600	1815	885	1985	1500	125	670	365	130
	1000	2000	10500	6	68	2760	670	1855	1080	2135	1650	150	820	365	150
	1250	2400	13500	6	70	3180	720	1875	1080	2135	1650	150	820	365	150
	1600	2800	17000	6	71	3830	920	2120	1110	2200	1715	150	820	365	180
	2000	3400	21000	6	73	4690	1090	2225	1340	2310	1825	200	1070	365	180
	2500	4100	26500	6	76	5580	1320	2400	1380	2445	1960	200	1070	365	220
	3150	5100	33000	7	78	6590	1480	2620	1450	2530	2045	200	1070	365	265
4000*	6000	38000	7	80	7770	1820	2810	1540	2530	2045	200	1070	365	265	
5000*	6600	43000	8	81	9480	2350	3030	1610	2620	2135	200	1070	365	265	
6300*	7300	47000	8	82	11560	2830	3240	1670	2740	2255	200	1070	365	265	

TU3036 - AoBk	KVA	Po (W)	Pcc (75°C) (W)	Uk (75°C) %	LwA dB(A)	Total (kg)	Oil (kg)	A (mm)	B (mm)	C (mm)	D (mm)	M (mm)	P (mm)	J (mm)	G (mm)
	100	270	1950	4	54	690	180	1085	720	1520	1035	125	520	365	90
	160	390	2550	4	57	880	220	1150	730	1610	1125	125	520	365	90
	200	470	3050	4	59	1030	290	1225	815	1655	1170	125	520	365	90
	250	550	3500	4	60	1190	280	1290	845	1655	1170	125	520	365	120
	315	670	4200	4	62	1390	320	1320	870	1700	1215	125	670	365	120
	400	790	4900	4	63	1530	360	1295	915	1870	1385	125	670	365	120
	500	950	5700	4	64	1770	410	1385	870	1865	1380	125	670	365	120
	630	1100	6500	4	65	2140	490	1420	865	1995	1510	125	670	365	130
	800	1300	8400	6	66	2390	590	1815	885	1985	1500	125	670	365	130
	1000	1450	10500	6	67	2820	660	1855	1080	2135	1650	150	820	365	150
	1250	1750	13500	6	68	3240	710	1875	1080	2135	1650	150	820	365	150
	1600	2200	17000	6	69	3910	900	2120	1110	2200	1715	150	820	365	180
	2000	2700	21000	6	71	4790	1070	2225	1340	2310	1825	200	1070	365	180
	2500	3200	26500	6	73	5690	1290	2400	1380	2445	1960	200	1070	365	220
	3150	3900	33000	7	75	6720	1450	2620	1450	2530	2045	200	1070	365	265
4000*	4600	38000	7	77	7930	1780	2810	1540	2530	2045	200	1070	365	265	
5000*	5100	43000	8	78	9670	2300	3030	1610	2620	2135	200	1070	365	265	
6300*	5600	47000	8	79	11800	2770	3240	1670	2740	2255	200	1070	365	265	

* solo versione con conservatore/NOT provided on hermetically sealed transformers

Scheda tecnica serie CoBk – AoBk
 Technical data sheet series CoBk – AoBk

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Characteristic are indicative. GBE will confirm actual data at offer/order stage.



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**TRANSFORMERLESS
CENTRAL
INVERTERS
WITH A SINGLE
POWER BLOCK****Up to 1800 kVA at 1500 V****Maximum power density**

These PV central inverters feature more power per cubic foot. Thanks to the use of high-quality components, this inverter series performs at the highest possible level.

Latest generation electronics

The B Series inverters integrate an innovative control unit that runs faster and performs a more efficient and sophisticated inverter control, as it uses a last-generation digital signal processor. Furthermore, the hardware of the control unit allows some more accurate measurements and very reliable protections.

These inverters feature a low voltage ride-through capability and also a lower power consumption thanks to a more efficient power supply electronic board.

Improved AC connection

The output connection has been designed in order to facilitate a direct close-coupled connection with the MV transformer.

Maximum protection

These three phase inverters are equipped with a motorized DC switch to decouple the PV generator from the inverter. Moreover, they are also supplied with a motorized AC circuit breaker. Optionally, they can be supplied with DC fuses, smart grounding kit and input current monitoring.

Maximum efficiency values

Through the use of innovative electronic conversion topologies, efficiency values of up to 98.9% can be achieved. Thanks to a sophisticated control algorithm, this equipment can guarantee maximum efficiency depending on the PV power available.

Enhanced functionality

This new INGECON® SUN Power range features a revamped, improved enclosure which, together with its innovative air cooling system, makes it possible to increase the ambient operating temperature.



Up to 1800 kVA at 1500 V

Long-lasting design

The inverters have been designed to guarantee a long life expectancy, as demonstrated by the stress tests they are subjected to. Standard 5 year warranty, extendable for up to 25 years.

Grid support

The INGECON® SUN Power B Series has been designed to comply with the grid connection requirements in different countries, contributing to the quality and stability of the electric system. These inverters therefore feature a low voltage ride-through capability, and can deliver reactive power and control the active power delivered to the grid. Moreover,

they can operate in weak power grids with a low short-circuit ratio (SCR).

Ease of maintenance

All the elements can be removed or replaced directly from the inverter's front side, thanks to its new design.

Easy to operate

The INGECON® SUN Power inverters feature an LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables.

The display also includes a number of LEDs to show the inverter operating status with warning lights to indicate any incidents. All this helps to simplify and facilitate maintenance tasks.

Monitoring and communication

Ethernet communications supplied as standard. The following applications are included at no extra cost: INGECON® SUN Manager, INGECON® SUN Monitor and its Smartphone version Web Monitor, available on the App Store. These applications are used for monitoring and recording the inverter's internal operating variables through the Internet (alarms, real time production, etc.), in addition to the historical production data.

Two communication ports available (one for monitoring and one for plant controlling), allowing fast and simultaneous plant control.

PROTECTIONS

- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation failure DC.
- Up to 15 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.
- Low-voltage ride-through capability.
- Hardware protection via firmware.
- Additional protection for the power electronics, as it is air-cooled by a closed loop.

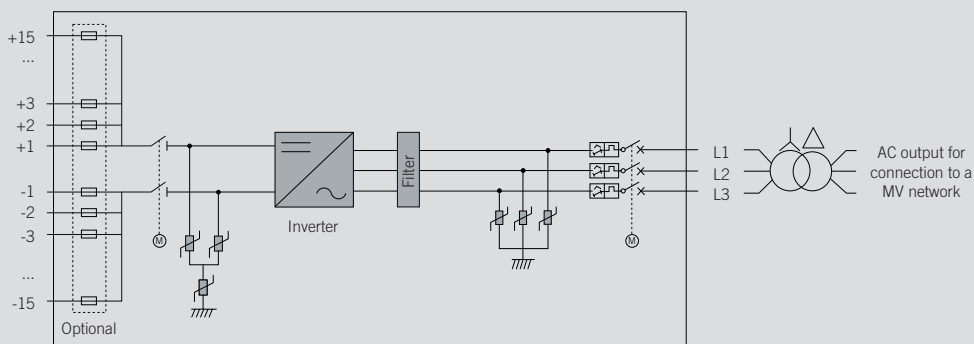
OPTIONAL ACCESSORIES

- Auxiliary services feeder.
- Grounding kit.
- Heating kit, for operating at an ambient temperature of down to -30 °C.
- Lightning induced DC surge arresters, type I+II.
- DC fuses.
- Monitoring of the DC currents.
- Sand trap kit.
- Wattmeter on the AC side.
- PID prevention kit (PID: Potential Induced Degradation).
- Nighttime reactive power injection.
- Integrated DC combiner box.

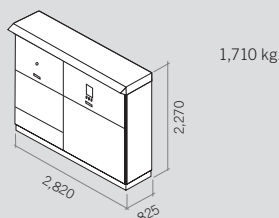
ADVANTAGES OF THE B SERIES

- Higher power density.
- Latest generation electronics.
- More efficient electronic protection.
- Night time supply to communicate with the inverter at night.
- Enhanced performance.
- Easier maintenance thanks to its new design and enclosure.
- Lightweight spares.
- It allows to ground the PV array.
- Components easily replaceable.

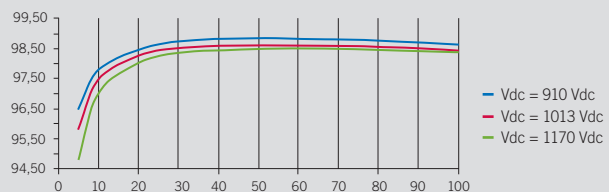
Power B Series



Size and weight (mm)



Efficiency INGECON® SUN 1640TL B630



	1170TL B450	1400TL B540	1500TL B578	1560TL B600	1600TL B615
Input (DC)					
Recommended PV array power range ⁽¹⁾	1,157 - 1,520 kWp	1,389 - 1,824 kWp	1,487 - 1,952 kWp	1,543 - 2,027 kWp	1,582 - 2,077 kWp
Voltage Range MPP ⁽²⁾	643 - 1,300 V	768 - 1,300 V	821 - 1,300 V	852 - 1,300 V	873 - 1,300 V
Maximum voltage ⁽³⁾	1,500 V				
Maximum current	1,870 A				
N° inputs with fuse holders	6 up to 15 (up to 12 with the combiner box)				
Fuse dimensions	63 A / 1,500 V to 500 A / 1,500 V fuses (optional)				
Type of connection	Connection to copper bars				
Power blocks	1				
MPPT	1				
Max. current at each input	From 40 A to 350 A for positive and negative poles				
Input protections					
Overvoltage protections	Type II surge arresters (type I+II optional)				
DC switch	Motorized DC load break disconnect				
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton				
Output (AC)					
Power IP54 @30 °C / @50 °C	1,169 kVA / 1,052 kVA	1,403 kVA / 1,263 kVA	1,502 kVA / 1,352 kVA	1,559 kVA / 1,403 kVA	1,598 kVA / 1,438 kVA
Current IP54 @30 °C / @50 °C	1,500 A / 1,350 A				
Power IP56 @27 °C / @50 °C ⁽⁴⁾	1,169 kVA / 1,035 kVA	1,403 kVA / 1,242 kVA	1,502 kVA / 1,330 kVA	1,559 kVA / 1,380 kVA	1,598 kVA / 1,415 kVA
Current IP56 @ 27°C / @ 50°C ⁽⁴⁾	1,500 A / 1,328 A				
Rated voltage ⁽⁵⁾	450 V IT System	540 V IT System	578 V IT System	600 V IT System	615 V IT System
Frequency	50 / 60 Hz				
Power Factor adjustable	Yes, 0-1 (leading / lagging)				
THD (Total Harmonic Distortion) ⁽⁶⁾	<3%				
Output protections					
Overvoltage protections	Type II surge arresters				
AC breaker	Motorized AC circuit breaker				
Anti-islanding protection	Yes, with automatic disconnection				
Other protections	AC short circuits and overloads				
Features					
Maximum efficiency	98.9%				
Euroefficiency	98.5%				
Max. consumption aux. services	4,700 W (25 A)				
Stand-by or night consumption ⁽⁷⁾	90 W				
Average power consumption per day	2,000 W				
General Information					
Ambient temperature	-20 °C to +57 °C				
Relative humidity (non-condensing)	0 - 100%				
Protection class	IP54 (IP56 with the sand trap kit)				
Corrosion protection	C5H				
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's solar sales department)				
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)				
Air flow range	0 - 7,800 m ³ /h				
Average air flow	4,200 m ³ /h				
Acoustic emission (100% / 50% load)	<66 dB(A) at 10m / <54.5 dB(A) at 10m				
Marking	CE				
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC 62103, EN 50178, FCC Part 15, AS3100				
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. 2019-04, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 3.0), Chilean Grid Code, Ecuadorian Grid Code, Peruan Grid code, Thailand PEA requirements, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code, RETIE Colombia				

Notes: ⁽¹⁾ Depending on the type of installation and geographical location. Data for STC conditions ⁽²⁾ V_{mpp,min} is for rated conditions (V_{ac}=1 p.u. and Power Factor=1). Without overmodulation, the V_{mpp,min} value is increased of approximately 2% ⁽³⁾ Consider the voltage increase of the 'Voc' at low temperatures ⁽⁴⁾ With the sand trap kit ⁽⁵⁾ Other AC voltages and powers available upon request ⁽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.

	1640TL B630	1665TL B640	1690TL B650	1740TL B670	1800TL B690
Input (DC)					
Recommended PV array power range ⁽¹⁾	1,620 - 2,128 kWp	1,646 - 2,162 kWp	1,672 - 2,196 kWp	1,723 - 2,263 kWp	1,775 - 2,330 kWp
Voltage Range MPP ⁽²⁾	894 - 1,300 V	907 - 1,300 V	921 - 1,300 V	949 - 1,300 V	977 - 1,300 V
Maximum voltage ⁽³⁾	1,500 V				
Maximum current	1,870 A				
N° inputs with fuse holders	6 up to 15 (up to 12 with the combiner box)				
Fuse dimensions	63 A / 1,500 V to 500 A / 1,500 V fuses (optional)				
Type of connection	Connection to copper bars				
Power blocks	1				
MPPT	1				
Max. current at each input	From 40 A to 350 A for positive and negative poles				
Input protections					
Overvoltage protections	Type II surge arresters (type I+II optional)				
DC switch	Motorized DC load break disconnect				
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton				
Output (AC)					
Power IP54 @30 °C / @50 °C	1,637 kVA / 1,473 kVA	1,663 kVA / 1,496.5 kVA	1,689 kVA / 1,520 kVA	1,741 kVA / 1,567 kVA	1,793 kVA / 1,613 kVA
Current IP54 @30 °C / @50 °C	1,500 A / 1,350 A				
Power IP56 @27 °C / @50 °C ⁽⁴⁾	1,637 kVA / 1,449 kVA	1,663 kVA / 1,472 kVA	1,689 kVA / 1,495 kVA	1,741 kVA / 1,541 kVA	1,793 kVA / 1,587 kVA
Current IP56 @27 °C / @50 °C ⁽⁴⁾	1,500 A / 1,328 A				
Rated voltage ⁽⁵⁾	630 V IT System	640 V IT System	650 V IT System	670 V IT System	690 V IT System
Frequency	50 / 60 Hz				
Power Factor adjustable	Yes, 0-1 (leading / lagging)				
THD (Total Harmonic Distortion) ⁽⁶⁾	<3%				
Output protections					
Overvoltage protections	Type II surge arresters				
AC breaker	Motorized AC circuit breaker				
Anti-islanding protection	Yes, with automatic disconnection				
Other protections	AC short circuits and overloads				
Features					
Maximum efficiency	98.9%				
Euroefficiency	98.5%				
Max. consumption aux. services	4,700 W (25 A)				
Stand-by or night consumption ⁽⁷⁾	90 W				
Average power consumption per day	2,000 W				
General Information					
Operating temperature	-20 °C to +57 °C				
Relative humidity (non-condensing)	0 - 100%				
Protection class	IP54 (IP56 with the sand trap kit)				
Corrosion protection	C5H				
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's solar sales department)				
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)				
Air flow range	0 - 7,800 m ³ /h				
Average air flow	4,200 m ³ /h				
Acoustic emission (100% / 50% load)	<66 dB(A) at 10m / <54.5 dB(A) at 10m				
Marking	CE				
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC 62103, EN 50178, FCC Part 15, AS3100				
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 3.0), Chilean Grid Code, Ecuadorian Grid Code, Peruan Grid code, Thailand PEA requirements, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code, RETIE Colombia				

Notes: ⁽¹⁾ Depending on the type of installation and geographical location. Data for STC conditions ⁽²⁾ V_{mpp,min} is for rated conditions (V_{ac}=1 p.u. and Power Factor=1). Without overmodulation, the V_{mpp,min} value is increased of approximately 2% ⁽³⁾ Consider the voltage increase of the 'V_{oc}' at low temperatures ⁽⁴⁾ With the sand trap kit ⁽⁵⁾ Other AC voltages and powers available upon request ⁽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.



The next-generation-now horizontal single-axis solar tracker



TECHNICAL DATASHEET



Single-Axis Tracker

MAIN FEATURES

Tracking System	Horizontal Single-Axis with independent rows		
Tracking Range	up to $\pm 60^\circ$		
Drive System	Enclosed Slewing Drive, DC Motor		
Power Supply	PV Series Self-powered Supply 2.0 Optional: 120/240 Vac or 24 Vdc power-cable		
Tracking Algorithm	Astronomical with TeamTrack® Backtracking		
Communication	Open Thread	Full Wireless	Optional: RS-485 Full Wired RS-485 cable not included in Soltec scope
Wind Resistance	Per Local Codes		
Land Use Features	Independent Rows	YES	
	Slope North-South	up to 17%	
	Slope East-West	Unlimited	
	Ground Coverage Ratio	Configurable. Typical range: 30-50%	
Foundation	Driven Pile Ground Screw Concrete		
Temperature Range	Standard	- 4°F to +131°F -20°C to +55°C	
	Extended	-40°F to +131°F -40°C to +55°C	
Availability	>99%		
Modules	Standard: 72 / 78 cells Optional: 60 Cells; Crystalline, Thin Film (Solar Frontier, First Solar and others)		

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B&V Bankability report
DNV GL Technology
Review available
RWDI WIND TUNNEL TESTED

MODULE CONFIGURATIONS Approximate Dimensions

	Length	Height	Width		Length	Height	Width
2x28	29.2 m (95' 10")	4.1 m (13' 4")	4.1 m (13' 4")	2x42	43.6 m (143')	4.1 m (13' 4")	4.1 m (13' 4")
2x29	30.2 m (99' 1")			2x43.5	45.6 m (149' 7")		
2x30	31.4 m (103')			2x45	46.7 m (153' 3")		

SERVICES

Pull Test Plan	Commissioning Plan
Factory Support Plan	Operation & Maintenance Plan
Onsite Advisory Plan	Tracker Monitoring System Plan
Construction Plan	Solmate Customer Care

MAINTENANCE ADVANTAGES

Self-lubricating Bearings
Face to Face Cleaning Mode
2x Wider Aisles

WARRANTY

Structure 10 years (extendable)
Motor 5 years (extendable)
Electronics 5 years (extendable)



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