



PHOTOVOLTAIC WORLD CLASS **TRANSFORMER** MANUFACTURER

EMC STEEL & SERVICES CORP.

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www.emcsteel.com

Our manufacturing company offers a comprehensive electrical engineering plant that provides high quality Transformers, Metallurgy Industry Solutions and Power Substation Turnkey Projects.

We produce a full range of transformers including Distribution transformers up to 500kVA 35KV, Power transformers up to 100 MVA 230KV, Photovoltaic Solar Inverter transformers from 500kVA to 315MVA, Dry type transformers up to 10 MVA 35KV, Padmount transformers, Furnace transformers and other special application transformers. We have obtained ISO9001, ISO14001, UL, OHSAS18001 certificates and KEMA, CESI test report for our large transformers.

We provide various electric furnace solutions such as electric arc furnace, induction melting furnace, ladle refining furnace and submerged arc furnace for steel making and metallurgy industry.

We are also experienced in power substation turnkey projects, and we offer power substations equipment such as CT, PT, circuit breakers, insulator, cables, switchgear, disconnectors, GIS, etc.

Our Company ensures that each one of our delivered units has undergone rigorous full acceptance testing. We provide one- package service from consulting, quoting, manufacturing, installation, commissioning, training to after sale services, with the support of our customers, we have achieved significant result in our business, our products are now operating in more than 50 countries in the world. We aim to be your most reliable supplier as well as your best partner in business!

OUR GOAL

As a manufacturer of high-efficiency equipment for the energy sector, our company always strives to achieve its environmental goals in improving energy efficiency globally. It is part of our large investment in technology that allows us to manufacture high-performance equipment such as Transformers for Solar Inverters (Photovoltaic) with K-Factor Elevator design for the renewable energy industries. All in order to be able to manufacture our valuable customers their equipment in an average of 90 days, and with the most competitive prices in the market so that we can all continue working together for the improvement of our planet.

"Some Manufacturing Designs"



Our company can manufacture various designs as per the needs and requirements of our customers.

FACTOR-K Design

The main benefit of a transformer with a K-factor design is its **increased ability to handle non-linear loads with high harmonic content**, resulting in greater durability and energy efficiency compared to standard transformers.

Detailed explanation:

- **Increased resistance to nonlinear loads:** K-factor transformers are specifically designed to operate with nonlinear loads, such as those found in systems with power electronics, switching power supplies, welding equipment, etc. These loads generate harmonic currents that can cause overheating and damage to conventional transformers. The K-factor indicates the transformer's ability to withstand these harmonic currents without overheating, allowing for safer and more reliable operation.
- **Longer service life:** By reducing overheating and thermal stresses caused by harmonics, K-factor transformers have a longer service life than standard transformers. This translates into lower replacement and maintenance costs in the long run.
- **Better energy efficiency:** K-factor transformers can improve energy efficiency in systems with nonlinear loads by reducing energy losses associated with heating and waveform distortion.
- **Reduced Failures:** By better handling harmonic currents, K-factor transformers decrease the risk of failures and unplanned shutdowns, which can be critical in industrial and commercial settings.
- **Reduced need for oversizing:** In some cases, K-factor transformers can allow for more accurate sizing, reducing the need to oversize the transformer to compensate for the effects of harmonics.

In summary, a K-factor design in transformers offers significant benefits in terms of durability, efficiency, and reliability, especially in environments with non-linear loads.

STEP-UP Design

A step-up transformer increases the voltage of an electrical signal. Its main benefit is **to enable efficient transmission of energy over long distances, reducing heat losses (Joule losses) and allowing for more economical distribution of electricity.**

Detailed Benefits:

- **Efficient power transmission:** By raising the voltage, the current needed to carry the same amount of energy is reduced. This decreases energy losses in the form of heat in the transmission cables, making the process more efficient and cost-effective.
- **Reduced transmission costs:** Decreased energy losses result in lower transmission costs, especially over long distances.
- **Low-voltage sources can be used:** Allows lower-voltage sources to be used and transformed to a level suitable for specific applications.
- **Durability and reliability:** Step-up transformers are typically designed to be robust and durable, minimizing the need for maintenance and repairs.
- **Versatility:** They can be used in a variety of applications, from grid-level power transmission to power supply to electronic equipment.
- **Minimal interruptions:** They operate continuously without start-up issues, allowing for a constant and reliable power supply.
- **Low maintenance:** They are generally low maintenance, reducing operating costs.

In summary, step-up transformers are essential for efficient power transmission over long distances and for adapting different voltage levels to the needs of various devices and applications.

STEP-DOWN Design

A step-down transformer **reduces the voltage of the electricity**, allowing equipment that requires a lower voltage to be used safely and efficiently. This is useful in many applications, from electronics to industrial systems, where voltage reduction can prevent damage to equipment and improve safety.

Specific benefits of a step-down transformer:

- **Voltage Reduction:** The primary function is to decrease voltage, allowing equipment that cannot handle high voltages safely or efficiently to be used.
- **Improved safety:** By reducing voltage, the risk of electric shocks and other hazards associated with high voltages is minimized.
- **Increased energy efficiency:** In some cases, operating equipment at lower voltages can reduce energy consumption and improve overall system efficiency.
- **Equipment protection:** Step-down transformers can protect sensitive electronic equipment from excessive voltages that could damage them.
- **Flexibility:** They are versatile and can be used in a wide range of applications, from small electronic devices to industrial machinery.
- **Reduced costs:** In some cases, equipment that operates at lower voltages may be less expensive.
- **Adaptability:** They are available in different designs and configurations to adapt to various needs.
- **Lower environmental impact:** In some cases, using equipment at lower voltages can reduce energy consumption and therefore the environmental impact associated with electricity generation.

In summary, step-down transformers offer a combination of safety, efficiency, and flexibility that make them essential in many applications where voltage reduction is necessary.

Photovoltaic Solar Transformers



We manufacture from 500kVA up to 315MVA. These are typically designed for solar applications which operate at the fundamental frequency of an alternating system. They are designed for one or more output windings connected to the inverters' load. These have a STEP-UP design in which the transformers' primary voltage is at the low voltage side and the secondary is at the medium voltage side. These transformers are designed according to any specific customer requirements regarding voltage, power, low losses, sound level, operating conditions and more. Special attention is given to environmental impact and safety issues.

Inverters generate harmonic distortion, which can affect transformers negatively. Harmonics, or frequencies that are multiples of the fundamental frequency, cause increased losses in transformers, leading to potential overheating, reduced efficiency, and premature failure. Mitigation techniques include using our high K-FACTOR transformers.

A high K-FACTOR transformer is designed to handle loads with significant harmonic content, specifically addressing issues like overheating caused by non-linear loads. These transformers are engineered to withstand the additional heating effects of harmonics without overheating or derating, which can lead to premature failure in standard transformers.

Pad Mounted Transformer

3-Phase



The safety and security of tamper-proof pad mount transformers make them the ideal choice for installations which may be accessible by the public, or any situation where underground cabling is preferred. tamper-proof, compartmentalized, liquid-filled, pad-mounted (or pad mount for short) transformers are all-in-one units designed, built, and tested in accordance with the highest industry standards and can be customized with over-current protection, and sectionalized switching to give you maximum control over your distribution system.

Product Scope:

30 kVA - 10,000 kVA

Up to 35,000v

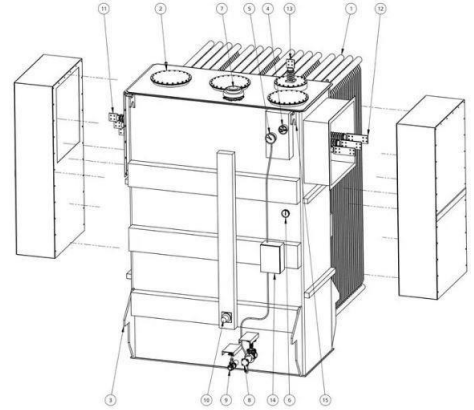
Standard specs:

- Type II non-PCB mineral oil (ONAN)
- High-grade silicon-steel core
- Aluminum windings
- Pad-lockable door handle
- No-load tap changer
- Impedance 5.75 % ($\pm 7.5\%$)
- Reinforced carbon steel tank
- Lifting lugs
- Externally clamped high- and low-voltage bushings
- Pressure relief valve
- Pressure vacuum gauge
- Liquid temp gauge
- Liquid level gauge
- Drain and sample valve
- Schrader valve
- Ground pads/lugs
- Nitrogen blanket
- 65 degree C rise

Optional Features:

- Environmentally friendly, high fire-point FR3 oil (KNAN)
- Copper windings
- Key interlock provisions
- Stainless steel tank
- Gauges with contacts
- Externally accessible drain and sample valve
- External gauge package
- Lid-mounted pressure relief device
- Sudden pressure relay
- Lightning arresters
- Viewing windows in cabinet
- 55/65 degree C rise
- Step-up solar and wind duty design
- Electrostatic shielding
- K-rated design

Substation Transformer



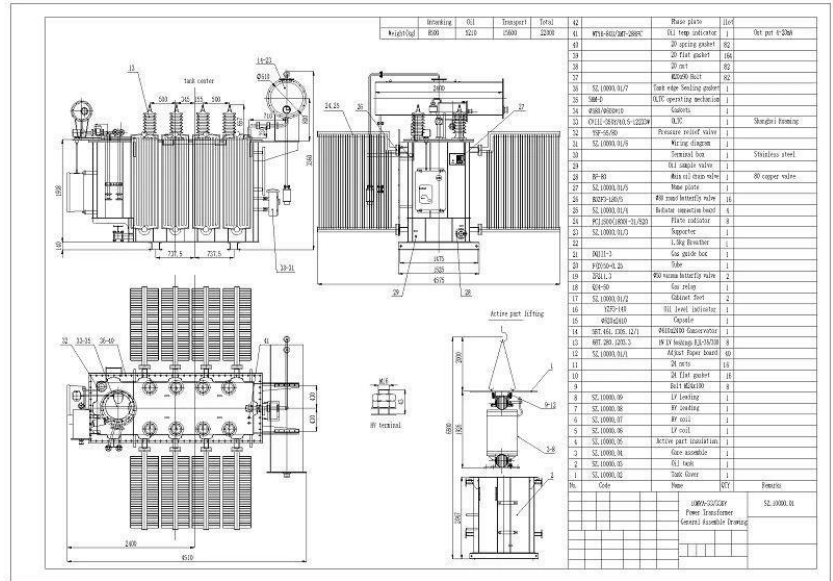
These liquid-filled distribution substation, and power-class substation transformers are designed, built, and tested in accordance with the highest industry standards including NEMA, ANSI C.57, DOE, and IEEE as applicable. With a range of customizable features, substations can be configured to maximize performance, minimize potential arc flash exposure, and address environmental concerns. All designs can be supplied with full or partial length air terminal chambers to make installation easy.

Product Scope:

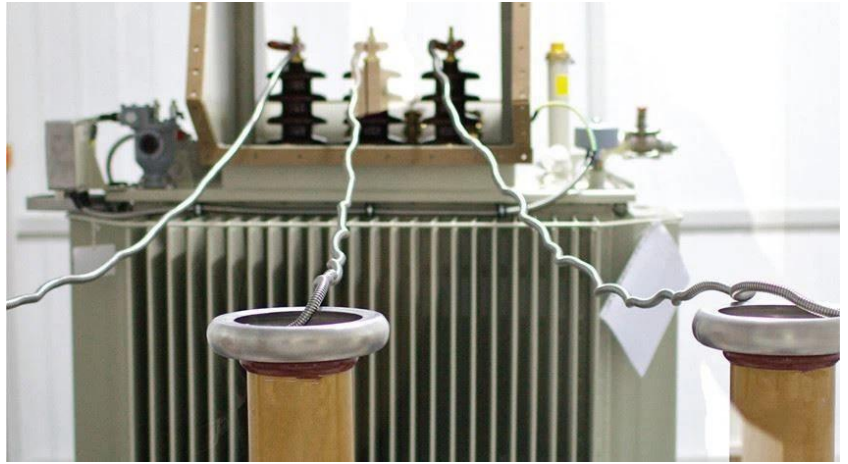
300 kVA - 30,000 kVA base
Up to 115kV

Standard Features	Optional Features
<ul style="list-style-type: none">• Type II non-PCB mineral oil (ONAN)• High-grade silicon-steel core• Aluminum windings (distribution class)• On-load tap changer• Reinforced carbon steel tank• Lifting lugs• Externally clamped high- and low-voltage bushings• Pressure relief valve• Pressure vacuum gauge• Liquid temp gauge• Liquid level gauge• Drain and sample valve• Schrader valve• Ground pads/lugs• Nitrogen blanket• 65 degree C rise	<ul style="list-style-type: none">• Environmentally friendly, high fire-point FR3 oil (KNAN)• Copper windings• On-load tap changer• Stainless steel tank• Gauges with contacts• Auxiliary control cabinet• Winding temperature indicator• Fan package (ONAN/ONAF)• Lid-mounted pressure relief device• Sudden pressure relay• Lightning arresters• 55/65 degree C rise• Step-up solar and wind duty design• Electrostatic shielding• K-rated design• Primary load-interrupter switch

Power Transformer



Distribution Transformer



These 150 KVA 3 phase transformers were delivered to Pakistan in 2019, the rated power of the transformer is 150 KVA. This 150 KVA Step Down transformer 11kv to 0.4kv, the primary voltage is 11kv, the secondary voltage is 0.4kv. We can supply both 150 KVA Step Up and Step-Down transformer, the cooling is ONAN. Our 150 KVA distribution transformer was designed with advanced technology and adopts high quality material and components which result in reliable quality and long operation time.

We ensured each one of our delivered transformers had passed the full acceptance test and we remain 0 fault rate record for more than 10 years so far, oil immersed power transformer is designed in accordance with IEC, ANSI and other major international standards.

Product Scope:

Product: Oil Immersed distribution Transformer

Rated Power: Up to 5000 KVA

Primary Voltage: Up to 35 KV

Core:

1. The core is made of high-permeable grain-orientated top quality cold-rolled silicon sheet
2. The silicon sheet fabrication adopts 'no-upper yoke lapped' technology and all lapped joints of the silicon sheet are 45 full-miters.

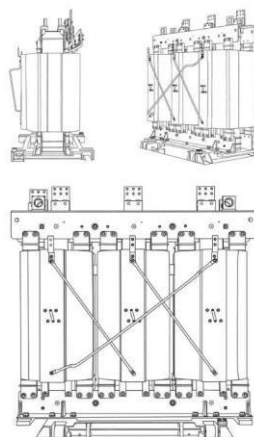
Winding:

1. Our windings are made of high quality copper.
2. Both High Voltage (HV) and Low Voltage (LV) windings are done using Coil Winding Machines. The Copper or Aluminum strips/wires used in winding are meticulously selected for its quality to give the best output. The Copper or Aluminum strips/wires are paper covered and act as insulators.

Oil Tank:

1. The oil tank is a transformer housing containing the iron core, winding and transformer oil.
2. The corrugated tank structure is fully sealed, and the corrugated will expand and compress with the increase of oil, isolating the transformer from the atmosphere and preventing oil deterioration and moisture. After oil removal, rust removal and phosphating treatment, the surface of corrugated oil tank is coated with rainproof paint. Moisture and salt spray.

Dry Type Transformer



Cast coil transformers are the ideal solution for voltage distribution in harsh environments with airborne dust or high humidity. The windings are vacuum cast inside a solid block of epoxy resin which provides the highest degree of protection to the windings. These are designed, built, and tested in accordance with the highest industry standards including NEMA, ANSI C.57, DOE, and IEEE as applicable. They are engineered for both indoor and outdoor applications and need minimal maintenance due to their rugged construction. Cast coil transformers use environmentally safe insulation systems that don't require fireproof vaults and catch basins that liquid filled transformers need. This allows the installation of cast coil transformers inside buildings close to the load, improving overall system regulation and reducing costly secondary line losses. The fiberglass reinforced construction of these units also provides higher short circuit strength and impulse voltage strength.

Product Scope:

100 kVA - 10,000 kVA
Up to 46kV (250kV BIL)

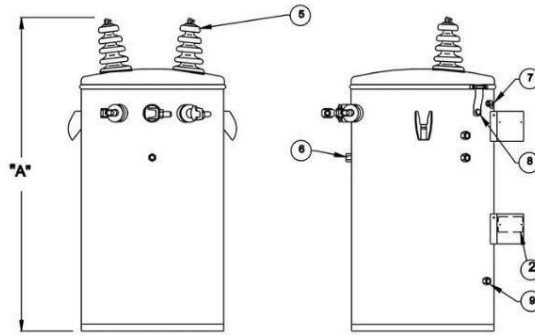
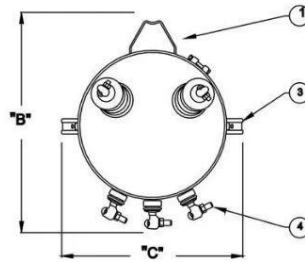
Standard specs:

- Self-Cooled (ANN/AN)
- 60Hz
- Aluminum (Al) Windings
- 180°C (115°C Temperature Rise)
- Primary taps $\pm 2 \times 2.5\%$
- Terminal Bus Stubs Suitable for Cables
- NEMA 1 Indoor
- ANSI 61 Grey Powder Coat

Optional upgrades

- Forced Air Cooled (AFN/AF)
- 50/60Hz
- Copper (Cu) Windings
- 80°C Rise Available
- Optional Unit-Substation or Pad mount Configuration
- NEMA 2, 3R, 4, 4X C 12
- Buss Coordination with switchgear (Unit-Substation configuration)
- Dial (Analog) or Digital Thermometers
- Neutral Ground Resistors (NGR) and Monitoring
- Anti-Condensation Strip Heaters
- Switching surge mitigating R.C. Snubber
- Ground Fault Protection Relays (GFR)
- Anti-Vibration mounting to reduce transformer hum (sound level)
- Provision for Seismic mounting or complete Seismic Snubbers and Restraints
- Distribution, Intermediate or Station Class Surge Arresters
- Provision for Buss Duct Entry
- Fully Insulated Buss
- Mimic Buss
- Kirk-Key Interlock

Pole Mounted Transformer



Liquid-filled pole mount transformers are designed, built, and tested in accordance with all applicable IEEE standards. Each unit is built to comply with the latest DOE efficiency regulations. They are ideal for utility applications requiring single-phase and three-phase distribution.

Product Scope:

5 kVA-333 kVA

High voltages: 2,400 to 34,500 (up to 150 kV BIL)

Low voltages: 120/240, 240/480, 277

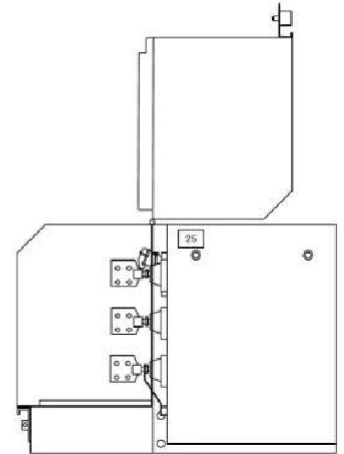
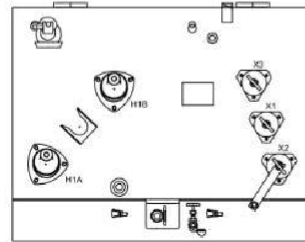
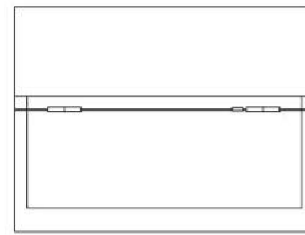
Standard specs:

- Type II non-PCB mineral oil (ONAN)
- 65°C temp rise
- Mild steel tank
- Corrosion resistant paint finish
- Lift points
- LV side-mounted bushings
- HV cover-mounted bushings
- All standard tap configurations available
- Grounding provisions
- Anodized aluminum or stainless steel nameplate
- ANSI 70 Gray paint color
- Aluminum windings
- Hanger brackets
- Arrester mounting pads
- Cover ground strap

Optional Features:

- HV taps (external lever handle or hook stick handle)
- Dual voltage
- Pressure relief device
- Internal fuses
- Switches
- Secondary circuit breaker
- Lightning arresters
- Environmentally friendly, high fire-point FR3 oil
- IFD (Internal Fault Detector)
- Copper windings
- Stainless steel tank

1-Phase



Single-phase pad mount transformers are designed to bring underground 1-phase power to homes, and commercial buildings from utility feeds. These units are perfect for urban public locations due to their tamper-proof and low profile design. These tamper-proof, liquid-filled, single-phase pad-mounted (or pad mount for short) transformers are designed, built, and tested in accordance with the highest industry standards. They feature a clamshell cabinet design allowing easy access in a compact footprint.

Product Scope:

5 kVA - 250 kVA
Up to 19.9 kV (150 kV BIL)

Standard specs:

- Type II non-PCB mineral oil (ONAN)
- High-grade silicon-steel core
- Aluminum windings
- Pad-lockable door handle
- DOE 2016 efficiency
- Reinforced carbon steel tank
- Lifting lugs
- Pressure relief valve
- Nitrogen blanket
- 65 degree C rise
- Bayonet fuse with drip shield
- Dead front well and insert HV bushings
- Paddle/spade or lug-connector type LV bushings

Optional specs:

- Environmentally friendly, high fire-point FR3 oil (KNAN)
- Copper windings
- Stainless steel tank
- High voltage taps
- Dual voltage
- Backup CL Fuse (internal)
- On-Off High Voltage Switch
- Removable Stud Bushing Wells

Project Reference No. 20170411 – Albania

Brief intro: The 60MVA power transformer was exported in Albania in March 2017.

Standard: IEC60076

Quantity: 1 unit

Year of Manufacturing: 2017

Place of Delivery: Albania

www.emcsteel.com

Technical Specification of the 60MVA power transformer

Rated Power: 60000KVA.

Primary voltage: 242KV

Secondary voltage 10.5KV

Vector Group: YNd11

Cooling: OFAF

Frequency: 50HZ

Phase: Three

Winding: Copper

Tapping: NLTC $\pm 2 \times 2.5\%$ at primary side

No load loss: 28kw

On load loss: 265kw



Project Reference No. 201G020-Vietnam

Brief intro: The 50MVA power transformer was exported to Vietnam in Aug 2019 for a steel plant's substation.

Standard: IEC60076

Quantity: 1 unit

Year of Manufacturing: 2019

Place of Delivery: Vietnam

www.emcsteel.com

Technical Specification of the 50MVA power transformer

Rated Power: 50000KVA.

Primary voltage: 115KV

Secondary voltage 38.5KV

Vector Group: YNd11

Cooling: ONAF

Frequency: 50HZ

Phase: Three

Winding: Copper

Tapping: OLTC $\pm 9 \times 1.78\%$ at primary side

No load loss: 28kw

On load loss: 265kw



CERTIFICATE OF COMPLIANCE

Certificate number UL-US-2412430-0
Report reference E539017-20240402
Date 2024-04-17

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Model	Product Description
ZGSABC-DE-XXXX/YY.YYY/Z.ZZZ, Where ZG represents Pad-mounted transformer, S represents three phases, A represents Insulation oil type, may be blank or R, blank represents Mineral oil, R represents less-flammable vegetable oil. B represents Winding Material, L represents Aluminum. C represents Core material, blank represents Electrical grade steel. D represents Primary Connection, maybe H or Z, H represents Loop, Z represents Radial. It represents Bushing type; blank represents Dead front. XXXX represents Rate Capacity, for UL may be 45, 75, 112.5, 150, 225, 300, 500, 750, 1000, 1500, 2000, 2500, 3750, 5000 KVA, for CUL maybe 75, 150, 225, 300, 500, 750, 1000, 1500, 2000, 3000 KVA. "YY.YYY" represents High voltage, for UL may be 12 represents 12000 GrdY/6930c or 12000Δ Vac, 12.47 represents 12470 GrdY/7200 or 12470 Δ Vac, 13.2 represents 13200 GrdY/7620 Vac, 13.8 represents 13800 GrdY/7970 or 13800 Δ Vac, 16.34 represents 16340Δ Vac, for CUL maybe 12.47 represents 12470 GrdY/7200 or 12470 Vac, 13.86 represents 13860 GrdY/8000 or 13860 Vac, /Z.ZZZ is optional, "Z.ZZZ" represents the Low voltage, may be 0.208 represents 208Y/120 Vac, 0.24 represents 240 Vac, 0.480 represents 480 or 480Y/277Vac, 0.600 represents 600 or 600Y/375 Vac. (X or Y or Z may be blank).	Three phase Distribution, Liquid-Immersed Pad-Mounted Transformers



David Piecuch
UL Mark Certification Program Manager

