Container Substations
and Electric Centers
Type SKP

Customer’s Satisfaction First

Saudi Elektrobudowa L.L.C.
For High and Medium Voltage

شركة الكتروبدوفا السعودية
لتقنية الجهد الكهربائي
SAUDI ELEKTROBUDOWA

PROFILE OF THE COMPANY

SAUDI ELEKTROBUDOWA L.L.C. (Limited Liability Company) is Riyadh-based, Saudi-Polish-Austrian Joint Venture enterprise specializing in delivery of reliable, high-quality, medium voltage switchgear electrical power systems.

ELEKTROBUDOWA SA from Poland, established in 1953, is a joint stock company present at Warsaw Stock Exchange since 1995. Being one of the leaders of Central European electrical contracting business ELEKTROBUDOWA is also one of the largest manufacturers of medium voltage switchgear in the European Union. Major manufacturing facility of Elektrobudowa SA is located in Konin, Poland.
Power generation

Primary Distribution

Industry

Infrastructure

ISO 9001

ISO 14001

AQAP
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Substation is equipped with different nominal voltage devices

ELEKTROBUDOWA SA is a European leader in industrial mobile container substations. Taking into consideration customer’s opinions and remarks ELEKTROBUDOWA SA is focused on client’s satisfaction, still improving construction solutions and applying high quality equipment.
1. GENERAL CHARACTERISTIC

Simplicity of construction, reliability and very good quality these are the reasons that mobile container substations manufactured by ELEKTROBUDOWA SA have very good opinion and are very high rated.

1.1. APPLICATION

SKP substations can be applied as a mobile or stationary distribution point or both transformer and distribution station. The advantages of using SKP substations can be fully observed in power industry and strip mining because of their main future – mobility. When equipped with high quality switchgear assemblies of high internal arc fault resistance, substation can be used as a main feeding point or temporary backup for large distribution stations for the time of their overhaul or when in need of adding new supply lines.

Properly equipped substation is suitable for wind or water power stations as power output power station. SKP substations have wide range of application including telecommunication systems, railway power supply, etc.

In addition, ELEKTROBUDOWA SA proposes container constructions adapted for social needs of operation personnel.
1.2. FEATURES

- wide range of application
- provision for installing any kind of equipment inside the substation
- safety for operation personnel
- overall dimensions tailored to the need of a user
- tightness and high protection degree (IP55)
- long life expectancy of the enclosure
- easy and quick installing
- mobility
- suitable for installation on vibrating constructions
- thief-proofing system and protection against unauthorized dismounting the substation from the outside
- unmanned stations as an option
- cable and overhead connection for power supply
- module design allows for extension, versatility of applications
- reasonable price comparing to advantages for the client
- small area needed for installation

Environment friendly production process and operation safety is guaranteed. Thanks to compact construction and small area needed for installation in connection with installation work limited to a minimum environment safety is ensured. In addition, nice and aesthetic design harmonizes with surroundings.

1.3. APPLICABLE STANDARDS

SKP substations have got all required certificates and conform to the PN-EN 61330: 2001 and PN-EN 60529: 2003 standards. Designing, manufacturing and installation is performed according to the ISO 9001, ISO 14001 and AQAP-110 standards.

1.4. AMBIENT CONDITIONS

Mobile container substations are designed to operate in temperature from -60°C up to +40°C. For special purposes please contact ELEKTROBUDOWA SA.
2. TECHNICAL DATA

Dimensions:
- width (A): 2300, 2500, 3250, 3500, 3700 and 4300 mm
- total width: A + 2 × 100 mm
- length (E)

\[ E = 2 \times E_1 + \sum_{i=1}^{n} S_i + n / 2 \]

- \( E_1 \) – wall thickness
  - 20 mm – non-insulated
  - 80 mm – 50 mm insulation fill
  - 130 mm – 100 mm insulation fill
- \( n \) – switchgear pitch number
- \( S \) – container pitch (depending on m.v. switchgear pitch)
- functional height (B): 2300 mm and 2550 mm
- height of the foundation frame (C): 120, 160, 260, 300 and 580 mm
- height of the pontoon and runners: on request, standard 410 mm + foundation frame (C) of height 65 mm or 100 mm
- height of the roof (D): 0.134 × A
- total height of the substation

\[ B + C + P + D \]

- roof angle: 15°
- mass of substation with equipment of total weight 24000 kg

<table>
<thead>
<tr>
<th>Average mass of SKP module</th>
<th>width A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall thermal insulation</td>
<td>3250 mm</td>
</tr>
<tr>
<td>non-insulated</td>
<td>350 kg</td>
</tr>
<tr>
<td>insulation</td>
<td>50 mm</td>
</tr>
<tr>
<td></td>
<td>100 mm</td>
</tr>
</tbody>
</table>

- enclosure protection degree: IP55
- power connection supply: cable, overhead, bus way
- noise suppression (with thermal insulation):
  - 50 mm – up to 28 dB/A
  - 100 mm – up to 30 dB/A
- temperature resistance of thermal insulation: 1000°C
- thermal conductivity (with thermal insulation):
  - 50 mm – \( \lambda_0 = 0.7 \text{ W/m}^2\text{K} \)
  - 100 mm – \( \lambda_0 = 0.37 \text{ W/m}^2\text{K} \)

Example of equipment lay-out in the SKP substation (section view A-A)
3. CONSTRUCTION
The SKP substation is assembled from units which widths are determined by the width of the switchgear cubicles installed inside. Total container length should not exceed 16 meters. Stations over 16 meters long are transported in parts.

We offer typical substation of functional height (B) 2300 mm and 2550 mm depending on height of the equipment installed inside.

Long life expectancy of the container is guaranteed by ELEKTROBUDOWA SA.

3.1. FRONT AND SIDE WALLS
Substation walls are made as:
- thermal insulated metal wainscot finished
- non-insulated:
  a) mounted using bolted joints
  b) with quick remove cover system

Quick remove cover system for non-insulated covers allows quick and easy access to the wall-mounted equipment

3.2. ROOF

The roof is made of thin walled shapes and zinc or AlZn coated sheets painted with polyester coat at least 100 μm thick. For the substations of thermal insulated construction roof is finished with metal wainscot. Safety flaps of high voltage cubicles and ventilation are mounted on the roof. If needed roof gutter can be mounted as well.

The enclosure is made of thin walled shapes and zinc or AlZn coated sheets. The structural parts of the substation are painted with polyester coat at least 100 μm thick. That ensures long life expectancy and failure free work for years, even under unpleasant conditions.

Joints of the part of enclosure are additionally sealed with silicone. Outer side of the substation enclosure is free of fasteners like bolts, rivets, etc.
3.3. FLOOR AND FOUNDATION FRAME

The substation floor is made of removable plates adequate for switchgear pitch. Each plate can be removed for cable lines inspection. Floor can be filled with thermal insulation. It is not used under switchgear cubicles, transformers and starters. If required, substation can be equipped with insulation rubber blanket or PVC floor finish.

The SKP substations can be provided with:

- monolithic foundation frames of height C made of steel shapes especially for stationary stations
- foundation frames of height 65 mm (or 100 mm) and steel pontoons of height P for transportation to eliminate cranes and road transport means
- monolithic foundation frames of height C with vibration damping elements, adjusted to be placed on vibrating constructions like for example strip mine conveyor belts, excavators, etc.

Substation with oil-immersed transformer is equipped with separate area with environment friendly oil slap located in foundation frame or pontoon. Oil can be safely pumped out from oil slap.

Stations founded on a high pontoon are equipped with steps. Access to a container founded on a high frame is ensured by stairs and landing.
3.4. DOORS

Door wings consist of door frame and outer and inner cover. The space between them is filled with 50 mm thermal insulation.

Every door wing is fitted with rubber seal. Anticorrosion protection is the same as for substation walls.

<table>
<thead>
<tr>
<th>door dimensions</th>
<th>width mm</th>
<th>height mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>functional height</td>
</tr>
<tr>
<td>single wing</td>
<td>900</td>
<td>B=2300</td>
</tr>
<tr>
<td>double wing</td>
<td>1250</td>
<td>2270</td>
</tr>
<tr>
<td>double wing</td>
<td>1500</td>
<td>2520</td>
</tr>
</tbody>
</table>

PANIK type door lock applied to SKP substations increase personnel safety of working staff. Fine screens mounted on door window, door lock and tough hinge make restricted area inaccessible for unauthorized personnel.

There is possibility of installing identical door locks opened with one key. Using different key locks it is possible to limit the access only for authorized personnel equipped with appropriate door keys. On request, doors can be locked with locker and door latch.

Inside door are made as fully covered with eye hole or openwork.
4. EQUIPMENT

Substation interior can be divided into separate areas with separate doors, for example high voltage switchgear and low voltage switchgear and social area together in one container.

4.1. INSTALLATION

Equipment to facilitate convenient and safe operation:
- lighting (basic and emergency)
- ventilation system
- heating system, with optional temperature control
- alarm system
- access control system
- fire-extinguishing system

All the systems are supplied from low voltage switchgear mounted inside the substation. Fans can be mounted on the roof as well on the side walls.
4.2. LOW VOLTAGE EQUIPMENT

SKP substation can be used as low voltage distribution point otherwise there is an area inside the substation appropriate for low voltage equipment:

- low voltage switchgear up to $I_n = 4500$ A type NGWR-1 (preferable)
- control boards, air-conditioned cubicle enclosures
- control and distribution boxes
- transformers up to 1600 kVA (dry types and oil-immersed)
- capacitors units, starters, inverters
- protective kit rack
4.3. MEDIUM VOLTAGE EQUIPMENT

ELEKTROBUDOWA SA is offering medium voltage equipment:
- Single unit switchgear up to 36 kV and $I_n = 3150$ A type J-7, J-17, J-24 and J-36
- Draw-out switchgear (metal-clad) up to 40.5 kV and $I_n = 4000$ A type D-12PT, D-17PT, D-12P(L), D-17P(L), D-24P(L) and D-40P or others
- Capacitor units in medium voltage switchgear cells
- Other electrical equipment

Switchgears manufactured by ELEKTROBUDOWA SA are arc resistant. Thanks to safety flaps installed on the roof internal arc fault gases are thrown away outside the substation.

Wall mounted switchgears can be easily accessed thanks to removable side walls. Monolith foundation frames with vibration damping elements allow to place the substations on vibrating clamping elements allow to place the substations on vibrating constructions i.e. strip mining excavators.
4.4. TRANSFORMERS

Dry type and oil-immersed transformers up to 40 kV and 1600 kVA can be installed in SKP substations. Internal wiring and cable connections are made by ELEKTROBUDOWA SA.

Depending on transformer type different enclosures can be applied:

- open-work metal enclosure
- special transformer chamber based on switchgear construction
- separate transformer chamber provided with inner and outer doors

On the roof, above the transformer chamber safety flaps are installed. Lamp lighting for transformer chamber illumination is also provided. Interlocking for appropriate cubicle doors can be applied to ensure safety operation and maintenance. Thanks to special construction solutions transformer exchange can be made quite quick and easy.

6/0,5 kV transformer chamber

4.5. CABLE CONNECTIONS

Substation equipped with appropriate terminals allows connecting wide range of cable types. Depending on foundation frame substation is equipped with floor and wall seal wire. When is needed, i.e. for large amount of cables, ELEKTROBUDOWA SA offers cable racks.
4.6. OVERHEAD WIRE CONNECTION FOR POWER SUPPLY

SKP substations can be connected to power supply system using overhead wire connection or enclosed busways. Every overhead connection must be considered individually.

5. TRANSPORT

Vehicle transport is preferred. Preparation for shipping and cargo secure is on ELEKTROBUDOWA SA responsibility. We prefer to allow ELEKTROBUDOWA SA to arrange transport and installation.

On request, customer can do it himself under ELEKTROBUDOWA SA supervision.

Stations of total length 16 meters are transported on low-loading semi-trailer. For handling use a crane of appropriate lifting capacity (at least 6 T) and certificated lifting slings of 10 m length.

All the safety standards for weight lifting must be observed. Station transport and handling must be done in compliance with the instructions given in technical documentation of SKP Mobile container substation.
6. FOUNDING & ASSEMBLING

It is strongly recommended to transport SKP substation to the target destination at once. Storage is not recommended but possible under several conditions. Storage area should be large enough, leveled and hardened (compacted earth).

6.1. FOUNDATION

Before substation is mounted foundation has to be prepared in compliance with design.

160 mm foundation frame with vibration damping is designed for founding substation on machine construction frame (for example mobile conveyor belt used in strip mining industry). Foundation frame and machine construction frame is welded joined.

120 mm monolithic foundation frame for stationary substations is designed for founding on ground foundation:

- on base plates with spot footing
- on bearing concrete (or metal) piles
- on reinforced slabs
Substations equipped with pontoon or runners are designed for founding straight on the ground. It is especially designed for founding on loose grounds, sandy grounds and strip mining area.

6.2. ASSEMBLING

After substation is founded all transportation cross-bars and lifting slings have to be detached. For foundation on machine construction it is necessary to make all needed welded joints.

All necessary cable connections are manufactory made. Assembling consists in:

- assembling connections to earthing
- connecting external cables
- assembling units which were delivered separately
- visual inspection
7. DESIGNING GUIDELINES

ELEKTROBUDOWA SA offers “turn key” substations including complete equipment and lay-out design. All to do is just contact ELEKTROBUDOWA SA Market & Sale Office.

NECESSARY INFORMATION

- type of foundation (frame, pontoon, runners)
- construction details (section 3)
- electrical equipment (section 4 and ELEKTROBUDOWA SA folders)
- main circuits diagrams with detailed list of apparatus and power supply connections
- auxiliary circuits details:
  - apparatus list
  - control diagrams
  - assembly diagrams
  - equipment lay-out
  - auxiliary circuit wiring and routing
- interlocking selection (transformer chambers and medium voltage switchgears)
- main and auxiliary apparatus list on computer diskette
- station lay-out
- notes, descriptions, instructions, etc
- color (standard: RAL 7032, grey)

Foundation on machine construction must be considered individually. In need please contact ELEKTROBUDOWA SA Division Company, Energy Distribution Market in Konin.

Example of electrical diagram of 12 kV substation
Example of 30 kV station diagram

Overhead connection of power supply

30 kV station with overhead connection lay-out
The information in this document contains general descriptions of the product, which do not always have to be present in particular cases / versions.

Manufacturer has a right to make changes in course of technical development of the product.

Because technical standards and specifications can be subject of change in case of doubts please always ask for confirmation of the information given in this publication.