DRIESCHER Y WITTJOHANN, S.A.
Medium Voltage Solutions

DRIWISA

# TECHNICAL SPECIFICATIONS

## COMPACT MEDIUM-VOLTAGE AIR-INSULATED SUBSTATIONS

# DWPP TYPE

# Contents

## 1. General Characteristics

DWPP-type compact air-insulated medium-voltage substations are used in medium-voltage distribution networks ranging from 4.16 kV to 38 kV, with currents of 400 or 630 Amps, to operate in conjunction with substation-type transformers and distribution panels.

**Applications**

- Connection and disconnection operations for medium-voltage distribution networks under load.
- Connection and disconnection of distribution transformers.
- As medium-voltage feeder panels for industrial and commercial facilities.

**Features**

- Dead-front design to prevent any accidental contact by the operator with live (energized) parts.
- Shatterproof glass window.
- Direct manual operation of the three-pole disconnecting blades under load and without load, without mechanical transmission systems or additional operating mechanisms.
- Mechanical and/or electromechanical interlocks that prevent the three-pole operating switch from being operated under load when unloaded.
- Mechanical interlocks that prevent the door from opening when the three-pole operating blade is closed under load.
- Mechanical interlocks that prevent the three-pole operating blade from operating under load when the door is open.
- Removal of blown current-limiting fuses using fuse extractor pliers.
- Surge protection via polymeric surge arresters.
- Short-circuit protection via current-limiting fuses (DRS).
- Available in three protection ratings:

  a. NEMA 1, for indoor service, protected against accidental contact with internal components.
  b. NEMA 12, for indoor service, dust-tight, with industrial polyurethane gasket between panels and tubular rubber gasket on doors.
  c. NEMA 3R, for outdoor service, rain-proof, with an industrial polyurethane seal between panels, a tubular rubber seal on doors, and internal heating elements.

**Advantages**

- Simple installation.
- Modular design (screw-together assembly).
- Can be supplied unassembled for on-site and/or room assembly without having to break through walls, and no trained personnel are required for such assembly.
- Future expansion without the need to purchase additional cells upfront, as they are assembled with screws as needed for growth.
- Safe and simple operation.
- Minimal maintenance.

## 2. n National Integration Level (GIN)

100% Domestic Manufacturing.

## 3. Standards

Compact medium-voltage substations comply with the following standards:

| | |
|---|---|
| NMX-J-098 | Electrical power systems—supply—standardized voltages . |
| NMX-J-564 | Disconnecting equipment and its control—Part 1: General specifications. |
| NMX-J-323 | On-load disconnecting switches for medium voltage - specifications and test methods. |
| NMX-J-068 | High-voltage switchgear. |
| NMX-J-149/1 | High-voltage fuses—Part 1: Circuit-breaking fuses—Current-limiting fuses. |
| IEC 62271-1 | Common specifications. |
| IEC 62271-103 | Switches for rated voltages above 1 kV and less than 52 kV. |
| IEC 62271-105 | Alternating current switch-fuse combinations. |
| IEC 62271-200 | AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV. |
| IEC 60273 | Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V. |
| IEC 60282-1 | High-voltage fuses - Part 1: Current-limiting fuses. |
| ANSI-IEEE STD C37.20.3 | Standard for metal-enclosed interrupter switchgear. |
| ANSI C37.22 | Preferred ratings and related required capabilities for indoor AC medium-voltage switches used in metal-enclosed switchgear. |
| IEEE STD C37.20.4-2001 | Standard for indoor AC switches (1 kV–38 kV) for use in metal-enclosed switchgear. |

## 4. Service Conditions

Compact air-insulated medium-voltage substations are capable of operating normally within the range of the following environmental conditions:

- NEMA 1 / NEMA 12

Temperature: -10 °C / +40 °C.
Relative humidity: < 60%
Altitude: 1,000 m a.s.l. *

- NEMA 3R

Temperature: -10 °C / +40 °C.
Relative humidity: 90%
Altitude: 1000 m a.s.l. *

*For higher installation altitudes, the corresponding correction factors must be applied. (IEC 60694)

The metal enclosure (substation or panel) has the appropriate NEMA or IP protection rating to ensure the specified temperature and humidity conditions inside, as well as to keep the interior free of smoke, corrosive or explosive gases and vapors, and electrically conductive particles (dust).

| | |
|---|---|
| IEC 60529 | Degrees of protection provided by enclosures (IP Code). |
| NEMA 250 | Enclosures for electrical equipment (1000 volts maximum). |

## 5. Electrical Capacities

Compact air-insulated medium-voltage substations comply with the following electrical values (in accordance with the standards in Section 3 Standards):

| MAXIMUM VOLTAGE<br>**kV** | RATED CURRENT<br>**A** | PEAK CURRENT<br>**kA** | SHORT-TIME CURRENT<br>**kA (rms) @ 3 sec** | PULSE VOLTAGE<br>(BIL) 1.2 × 50 µs<br>**kV** | APPLIED VOLTAGE<br>60 Hz 1 min. DRY<br>**kV** |
|---|---|---|---|---|---|
| 7.2 | 400 | 65 | 25 | 60 | 20 |
| | 630 | 65 | 25 | 60 | 20 |
| 17.5 | 400 | 65 | 25 | 95 | 38 |
| | 630 | 65 | 25 | 95 | 38 |
| 25.8 | 400 | 65 | 25 | 125 | 60 |
| | 630 | 65 | 25 | 125 | 60 |
| 38 | 400 | 65 | 25 | 150 | 80 |
| | 630 | 65 | 25 | 150 | 80 |

**5.1.** Rated operating capacities:

The maximum breaking current, mechanical life, and electrical life depend on the equipment installed inside.

See technical specifications for:

- Three-pole no-load disconnect switch.
- Three-pole load-breaking disconnect switch.
- Grounding switches.

# 6. Construction

## 6.1. Cells

Compact air-insulated medium-voltage substations consist of modules assembled with bolts, allowing the original electrical configuration to be expanded, divided, or reduced using the following cells:

**a. Measurement Bay:**
The Metering Bay is designed to house metering and control equipment (voltage transformers, current transformers) from the power utility; this bay also includes the busbars for connecting the service connection.

**b. Through-Blade Bay:**
The Pass-Through Switch Cell is designed to house a “DTP”-type three-pole load-break switch, which is installed at the top of the cell, sharing connections and space with the switch cell to reduce the overall dimensions of the arrangement.
The primary function of the Pass-Through Switch Cell is to isolate the live section (power supply) from the rest of the cells once the three-pole live-switching knife switch (LDTP) has been opened, in order to safely perform maintenance on all equipment connected to the same line, including the main live-switching switch.
The design of this blade allows it to be used as a feeder cell, as it has sufficient space to accommodate the cable feed.

**c. Disconnector Bay:**
The Disconnector Cell is designed to house a three-pole live-line disconnector of the “LDTP” type, installed laterally to allow direct access to the quick-opening mechanisms from the front of the substation, eliminating the need for transmission mechanisms or other operating devices.
The three-pole load-break switch with a fuse holder base has clips (fuse mounting bases) arranged at a 60° angle to facilitate the removal or insertion of the fuse links (fuse extraction pliers must always be used as a safety tool to prevent burns from direct contact with the porcelain, as after an operation it can reach temperatures between 200 and 500°C).
This cell is normally supplied with surge arresters, but these may be omitted as required.

**d. Transformer Coupling Cell:**
The Transformer Coupling Cell is contained within the Disconnector Cell, eliminating the need for an additional cell and reducing the substation’s footprint. The copper coupling busbars are positioned at a mid-height to accommodate the transformer’s throat from the side and can be extended to the height required by the transformer (transformer drawings are required).

**e. Service Connection Bay:**
The Service Connection Bay is integrated into the pass-through switch bay (regardless of whether a no-load disconnect switch is requested in this bay) and the service connection is made directly to the busbars.

**f. Transition Bay:**
Given the functional design of DRIWISA® air-insulated medium-voltage compact substations, the transition bay is integrated within the disconnecting bay, eliminating bends in the copper busbars and optimizing energy usage.

### 6.2. Surge Arresters
Distribution-type metal oxide, distribution-class polymeric housing, PDV-100 heavy-duty model; solidly grounded neutral.

### 6.3. Feeder and coupling busbars
99.99% electrolytic copper feed-in and coupling busbars with 1/4" x 1-1/4" round edges, natural finish, and no insulation (sleeves) for rated currents up to 630 A, capable of withstanding short-time currents and complying with temperature rise limits in accordance with the standards indicated in Section 3. Additionally, copper bars with higher capacities and/or heat-shrinkable sleeves may be requested.

### 6.4. Insulators
They are made of non-hygroscopic, non-flammable material with sufficient mechanical strength to withstand the stresses generated by normal equipment operation and those caused by short-circuit currents. Their mechanical rigidity prevents deformations that could cause insulation failures in the disconnecting blades.

### 6.5. Structures, bases, and supports
They are manufactured from 12-gauge (2.78 mm) cold-rolled steel sheet with ¼-inch UNC riveted nuts for mounting side and top covers.

### 6.6. Doors and covers
They are made of 14-gauge (2 mm) cold-rolled steel sheet with mounting holes for easy installation on their frames. The front doors have a shatterproof window and stainless steel locks.

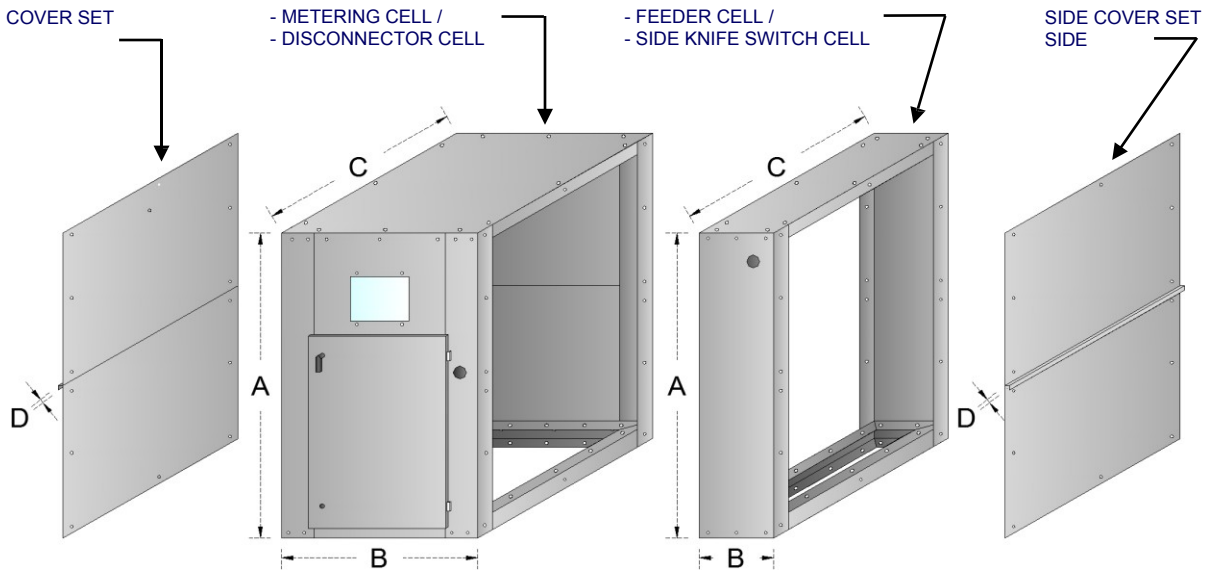
### 6.7. Finish
The structural sheets, bases, supports, covers, and doors are treated with a phosphating process and electrostatic powder coating in ANSI 61 gray (30 µm) on both the exterior and interior.

### 6.8. Hardware
- NEMA 1 and NEMA 12, Grade 2 cadmium-plated hardware.
- NEMA 3R. Grade 5 stainless steel hardware.

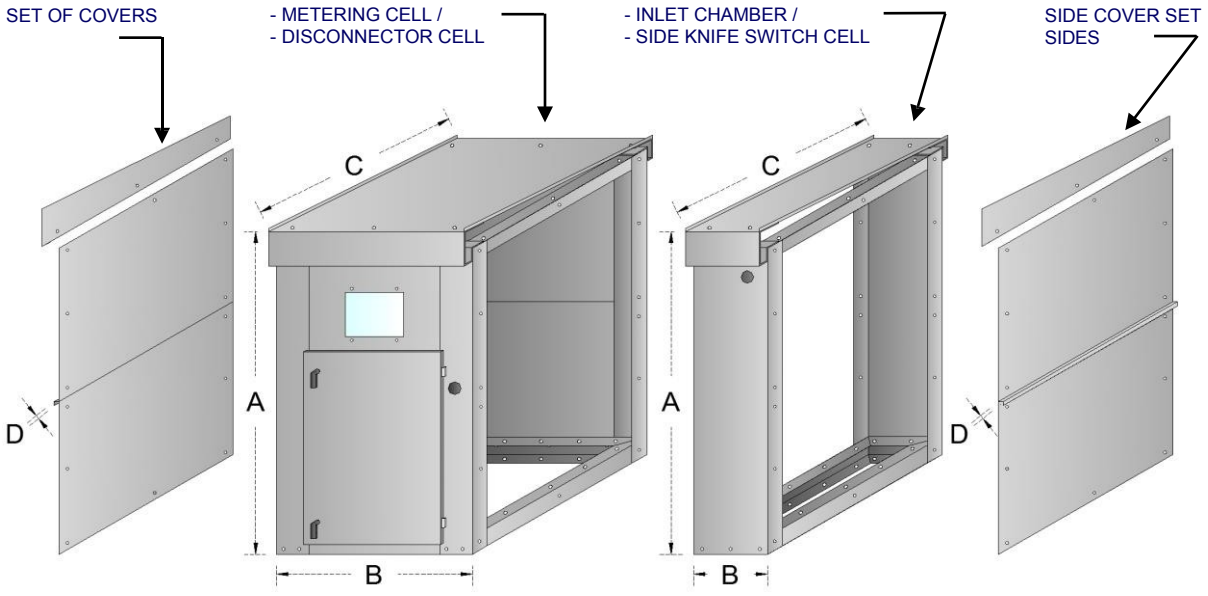
## 7. Dimensions

The dimensions of compact air-insulated medium-voltage substations depend on the required electrical configuration. Thanks to our DRIWISA design, our substations consist of only two types of modules, making the manufacturing of any electrical configuration versatile.

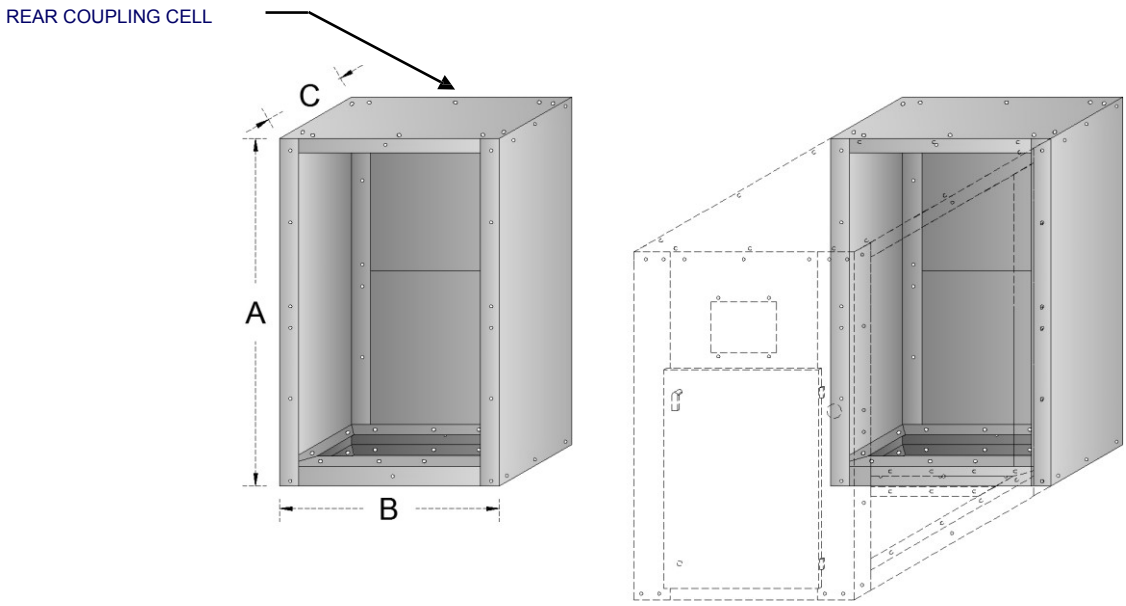
## NEMA 1 AND NEMA 12




## NEMA 3R



## REAR CONNECTION NEMA 1, NEMA 12, AND NEMA 3R




| CELLS | VOLTAGES FROM 4.8 kV TO 25 kV | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NEMA 1 (INDOOR) | | | | NEMA 12 (DUST-PROOF) | | | | NEMA 3R (OUTDOOR) | | | |
| | HEIGHT A (mm) | FRONT B (mm) | BACK C (mm) | TOP D (mm) | HEIGHT A (mm) | FRONT B (mm) | BOTTOM C (mm) | TOP D (mm) | HEIGHT A (mm) | FRONT B (mm) | BOTTOM C (mm) | TOP D (mm) |
| Service Connection | 1,902 | 455.50 | 1,218 | 13 | 1,902 | 455.50 | 1,218 | 13 | 2,035 | 455.50 | 1,340 | 13 |
| Step Blade Cell | 1,902 | 455.50 | 1,218 | 13 | 1,902 | 455.50 | 1,218 | 13 | 2,035 | 455.50 | 1,340 | 13 |
| Measurement Cell | 1,902 | 1,205.50 | 1,218 | 13 | 1,902 | 1,205.50 | 1,218 | 13 | 2,035 | 1,205.50 | 1,340 | 13 |
| Disconnector Cell | 1,902 | 1,205.50 | 1,218 | 13 | 1,902 | 1,205.50 | 1,218 | 13 | 2,035 | 1,205.50 | 1,340 | 13 |
| Rear Coupling Cell | 1,902 | 1,205.50 | 468 | - | 1,902 | 1,205.50 | 468 | - | 1,902 | 1,205.50 | 468 | - |

| CELLS | VOLTAGES FROM 30 kV TO 38 kV | | |
|---|---|---|---|
| | NEMA 1 (INDOOR) | NEMA 12 (DUST-PROOF) | NEMA 3R (OUTDOOR) |

| | HEIGHT A (mm) | FRONT B (mm) | BACK C (mm) | TOP D (mm) | HEIGHT A (mm) | FRONT B (mm) | BOTTOM C (mm) | TOP D (mm) | HEIGHT A (mm) | FRONT B (mm) | BOTTOM C (mm) | TOP D (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Connection | 2,295 | 507 | 1,518 | 13 | 2,295 | 507 | 1,518 | 13 | 2,410 | 507 | 1,640 | 13 |
| Step Blade Cell | 2,295 | 507 | 1,518 | 13 | 2,295 | 507 | 1,518 | 13 | 2,410 | 507 | 1,640 | 13 |
| Measurement Cell | 2,295 | 1,505.50 | 1,518 | 13 | 2,295 | 1,505.50 | 1,518 | 13 | 2,410 | 1,505.50 | 1,640 | 13 |
| Disconnec tor Cell | 2,295 | 1,505.50 | 1,518 | 13 | 2,295 | 1,505.50 | 1,518 | 13 | 2,410 | 1,505.50 | 1,640 | 13 |
| Cell Rear Coupling | 2,295 | 1,505.50 | 520 | - | $1,505.50 | 1,205.50 | 520 | - | 2,295 | 1,505.50 | 520 | - |

## 8. Technical Information

### 8.1. Drawings

Plans are provided in printed format (letter size, multiple of letter size) or in electronic format (2D and 3D) as required.

### 8.2. User Manuals

They are easily accessible on our website http://www.driwisa.com/manuales.htm

## 9. Testing

### 9.1. Prototype Test Reports

Prototype test reports are available from accredited national laboratories (LAPEM) that guarantee compliance with the values and capacities indicated in Section 5 Electrical Capacities.

- Short-circuit current (3 sec.).
- Temperature rise.
- Peak current.
- Lightning impulse voltage.
- Withstand voltage 1 min. at 60 Hz.

### 9.2. Routine tests

Routine tests are performed on every air-insulated medium-voltage compact substation. The routine tests are as follows:

- Visual inspection and dimensional analysis.
- Withstand voltage at 60 Hz.
- Insulation resistance test (megger).
- Contact resistance in main circuits.
- 10 mechanical operations.
- Mechanical operation tests on integrated safety blocks.

## 10. Marking

Compact air-insulated medium-voltage substations contain a data plate made of stainless steel with the following information engraved on it:

- Manufacturer's name.
- Serial number.
- Type and model.
- Rated voltage in kV.
- Dry lightning impulse withstand voltage (NBA) in kV.
- Rated current in A.
- Short-circuit current in kA.
- Operating altitude above sea level in m.
- Legend "Made in Mexico" or the designation of the country of origin.

## 11. Accessories and Spare Parts

### 11.1. Accessories

The following accessories are available as options to be installed before or after shipment of the compact air-insulated medium-voltage substation:

- Auxiliary coil trip system.
- Auxiliary contacts for indicating the position of the main switches.
- Auxiliary contacts for fuse status indication.
- Auxiliary contacts for indicating the position of grounding switches.
- Additional control levers.
- Dual fuse conversion kit.
- Conversion kit for installing larger or smaller fuses.
- Motorized drives for local or remote operation.
- Fuse extractor pliers.
- Set of side plates.
- Additional cells to the original array.
- Voltage indicators.
- Lubricants for conductive parts.

### 11.2. Spare Parts

All equipment components are available for supply for the maintenance or repair of air-insulated medium-voltage compact substations, such as:

- Fuse clamps, single or dual version.
- Insulators for bus supports.
- Mechanical interlock components.
- Door locks.
- Shatterproof windows.
- Set of side panels.
- Control levers.
- Additional cells beyond the original configuration.