SF6 FREE

DRIESCHER

- SF_6 - free
- Compact
- Non-pressurized
- Arc-fault free

ECOS-Z

24-kV switchgear

ECOS-Z

Fluid-insulated 24-kV medium-voltage switchgear

Applications

OPERATORS

Distribution system operators (DSOs) / municipal utilities / regional energy providers / energy suppliers

INDUSTRIAL CUSTOMERS

Chemical industry, automotive industry, companies with in-house power generation

COMMERCIAL SECTOR

Paper, metal, and food industries; large commercial estates

INFRASTRUCTURE

Data centers / critical infrastructure such as energy, water, healthcare, transport & mobility

POWER GENERATION

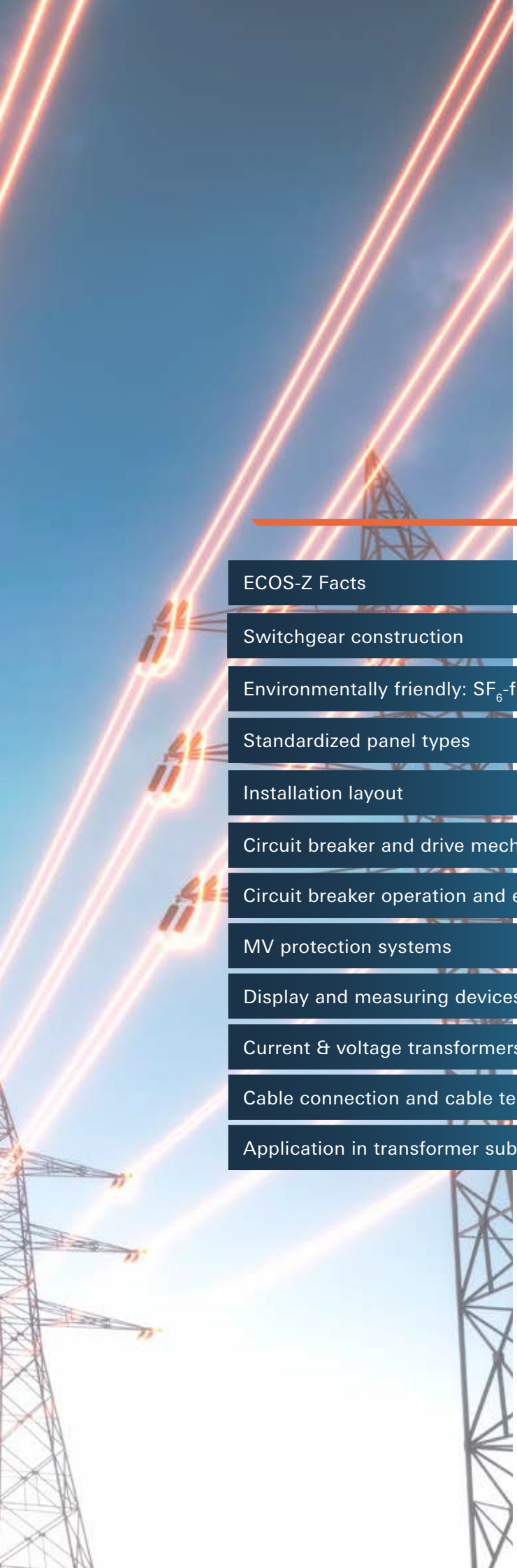
Photovoltaic, wind, and energy storage facilities

SYSTEM PARTNERS / INTEGRATION PARTNERS

Manufacturers of distribution substations, compact substations, and walk-in substations

PLANNING

Engineering and planning consultancies, general contractor



Contents

FACTS

MARKET-LEADING

The SF_6-free medium-voltage switchgear "ECOS-Z", designed for rated voltages up to 24 kV, is the most compact circuit-breaker system on the market with a panel width of just 240 mm. Equipped with first-class vacuum interrupters, the circuit breaker can reliably interrupt short-circuit currents of up to 20 kA for 3 seconds.

PRESSURELESS SYSTEM

The system poses no risk of pressure loading to the installation room. This means that proof of internal arc safety in accordance with DIN EN IEC 62271-202, Section 7.102, with reference to DIN EN IEC 62271-200:2023-04, Table A.1, "Parameters for internal arc tests in accordance with the construction of the cable compartment," is not required.

SUSTAINABLE

The fluid insulation "Midel 7131", classified by the German Federal Environment Agency as "not hazardous to water", has been proven in use for decades and is completely free of "F" components.

At the end of its service life, the system is 100% recyclable without incurring high costs.

ECOS-Z: The benefits at a glance

- **SF_6-free**
  A future without compromis
- **Internal arc-free**
  Phase faults technically excluded
- **Compact design**
  For minimal space requirements (240 mm panel width)
- **Pressureless system**
  No substation testing required
- **Proven technology**
  In practical operation for over 15 years

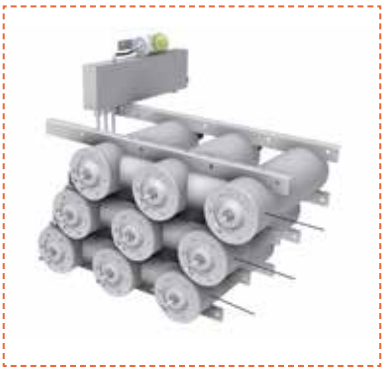
Switchgear in accordance with DIN EN IEC 62271-200

• Rated voltage	U_r	24 kV
• Rated short-time power frequency withstand voltage	U_d	
Phase to earth		50 kV
Across the switching gap (in the vacuum interrupter)		60 kV
• Rated lightning impulse withstand voltage	U_p	
Phase to earth		125 kV
Across the switching gap (in the vacuum interrupter)		145 kV
• Rated frequency	f_r	50 Hz
• Rated short-time withstand current	I_k	20 kA
• Rated short-circuit duration	t_k	1 s
• Rated peak withstand current	I_p	50 kA
• Rated normal current	I_r	630 A
• Ambient temperature		-25°C to +40 °C
• Service continuity		LSC 2 PM
• Degree of protection		
External enclosure		IP2X (IP3X optional)
Secondary compartment		IP3X
Circuit-breaker and busbar compartment		IP67
• Installation altitude		unlimited
• Insulating medium (external insulation of primary part)		Midel 7131 (synthetic ester)

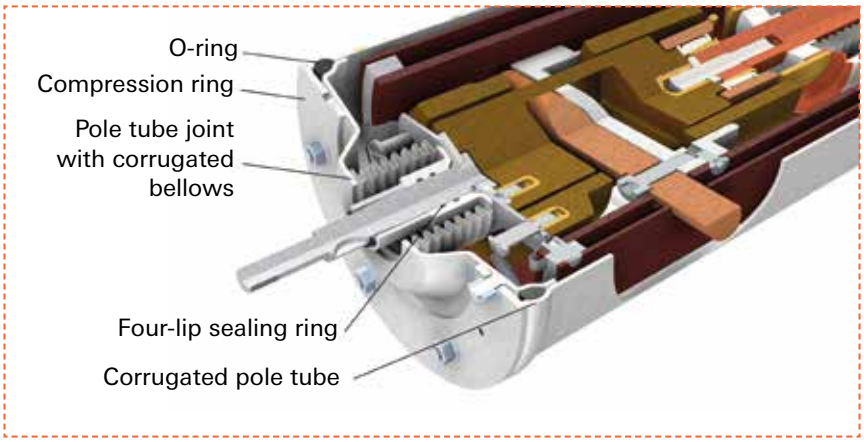
Switchgear design

The exceptionally compact dimensions, environmental friendliness, and high level of personal and system safety of the ECOS-Z are achieved through the fully single-pole, earthed metal enclosure of the entire system (making two- or three-phase faults/ short circuits practically impossible) and the proven SF_6-free fluid insulation Midel 7131.
The complete primary circuit of the breaker system—comprising the busbar and a single-pole circuit breaker equipped with high-quality vacuum interrupters—is housed in a corrosion-resistant steel pipe system, ensuring protection against corrosion and dust (IP67)
Special attention compared with the predecessor models WEVA was given to the tightness of the system. On the cable connection side, cast-resin bushings form the system boundary, while on the operating mechanism side a tightly bolted, maintenance-free metal diaphragm seals the system.

Thanks to the bolted design, individual vacuum interrupters can be replaced during overhaul, which is not possible with welded systems and would contradict the principle of sustainability.
An expansion tank ensures controlled volume expansion of the fluid insulation caused by temperature fluctuations and keeps stress on the seals to a minimum. A cartridge filled with silica gel beads ensures that no moisture enters the fluid through system breathing.
The switchgear enclosure and the compact operating mechanism are designed so that certain protection relay types, measuring and indication devices can be installed directly in the front operating area. As a result, in many cases a separate secondary compartment is not required (although it can be added at any time to meet extended requirements)



Three-phase pole tube design, three-panel configuration



Sectional view through the pole tube and metal diaphragm

Environmental friendliness

SF_6-free

In 1997, SF_6 was included in the Kyoto Protocol as a greenhouse gas subject to reduction. SF_6 is the most potent greenhouse gas known to date: 1 kg contributes as much to global warming as 23,900 kg of CO_2. For this reason, the use of SF_6 in Germany is prohibited at 20 kV and will also be banned at 30 kV from 2030 onwards.

As external insulation for the vacuum interrupters, the line-to-earth selector switch, and the busbars, the synthetic ester-based insulating fluid Midel 7131 is used. 15 kg of fluid are filled per circuit-breaker panel. Unlike gases, fluids can be sealed much more effectively due to their larger molecular size and non-volatility. Compared with solid insulation materials, aging resistance is higher, meaning that micro-cracking and the resulting partial discharges do not occur.

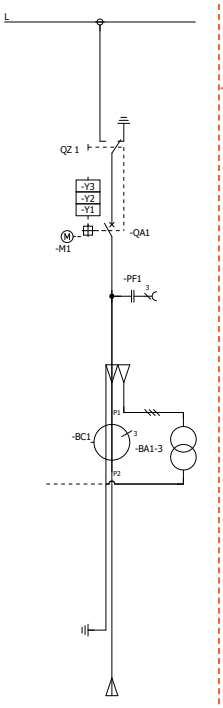
Advantages of the insulating medium Midel 7131

- Rapidly biodegradable
- Self-extinguishing
- Low, non-toxic smoke generation
- Non-toxic
- High fire point
- High moisture tolerance
- High thermal endurance
- Cost-effective and environmentally friendly to dispose of

Standardized panel types

Circuit-breaker panel T4*

(Cable panel, transformer panel)

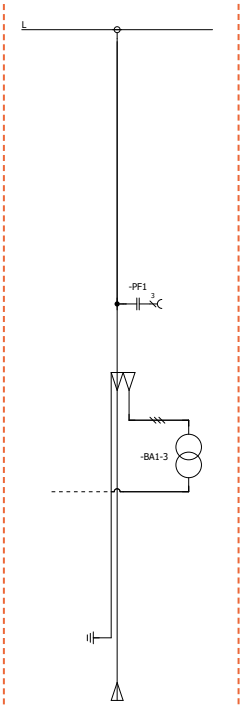


QA1	Circuit breaker
QZ1	Pre-Selector switch
PF1	Capacitive voltage indicator for incoming or outgoing cables
BC1	Retrofit cable current transformer
BC11	Current transformers / current sensors
BA11	Voltage transformers / voltage sensors

*The system is fitted exclusively with circuit breakers

Busbar panel T0

(Raiser panel, cable branch)

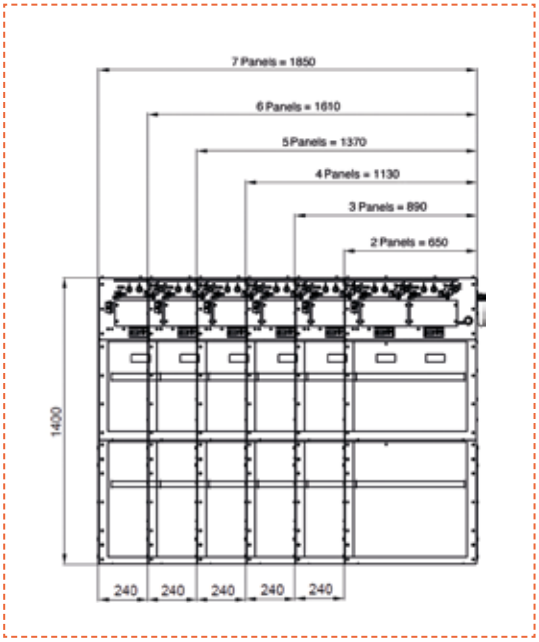


Information

The switching gap within the vacuum interrupter meets the dielectric requirements for an isolating distance in accordance with DIN EN 62271-1. For the switching gap (open contacts within the vacuum interrupter), a rated short-duration power-frequency withstand voltage Ud of 60 kV and a rated lightning impulse withstand voltage U_p of 145 kV have been verified.
This means that the switching device fulfills the requirements for a switch-disconnector circuit breaker in accordance with DIN EN IEC 62271-108.

2 to 7 panels

Height (mm) 1400
Width (mm) .....see illustration on the right
Depth (mm) 1040
Height of low-voltage compartment (mm) ..500
Depth of low-voltage compartment (mm) ...398
Overall height (mm) 1900



Installation

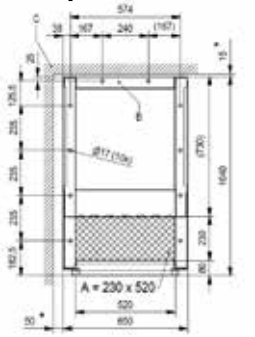
Pressure relief

Pressure relief for the system is not required, as the design inherently prevents the occurrence of an internal arc fault within the switchgear as well as in the cable connection compartment that would be associated with pressure loading of the installation room.

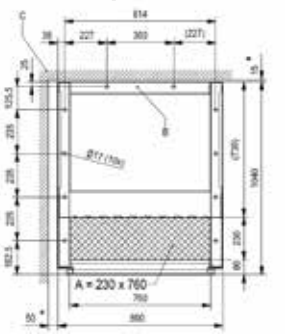
Floor openings and fixing points

The recommended floor recess should be 2 × 65 mm narrower than the overall width of the system. For the depth of the floor recess beneath the ECOS-Z switchgear, a dimension of 230–250 mm is recommended. The switchgear must be securely bolted to the floor at the designated fixing points shown, using ten M10 bolts at each location

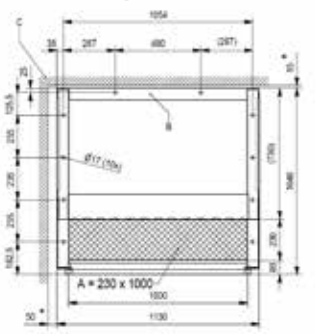
2 panels



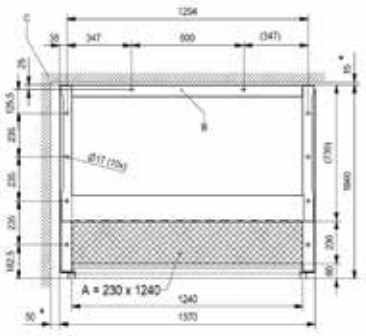
3 panels



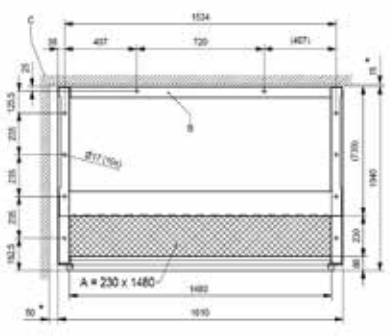
4 panels



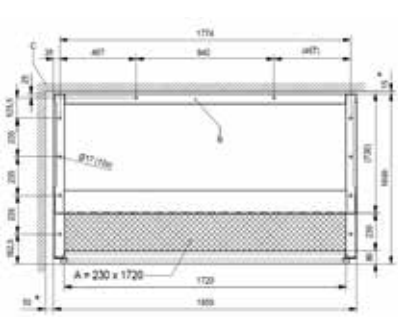
5 panels



6 panels



7 panels



Circuit breaker and operating mechanism

Vacuum circuit breaker in accordance with EN 62271-100

• Rated voltage	U_r	24 kV
• Rated short-circuit duration	t_k	3 s
• Rated short-time withstand current	I_k	20 kA
• Rated peak withstand current	I_p	50 kA
• Rated short-circuit breaking current	I_{sc}	20 kA
• Rated normal current	I_r	630 A
• Mechanical life-time		Class M2
• Electrical life-time		Class E1
• Rated switching sequence		O-0,3s-CO-3min-CO
• Extinguishing medium		Vacuum
• Operating mechanism		Spring-charged mechanism
• Spring-charging operation		Manual
		optional with motor drive

Specification

Each circuit-breaker panel (T4) is equipped with a uniform, modular spring-charged operating mechanism. In the standard version, the mechanism is designed for manual charging. However, it can be retrofitted with a suitable motor at any time. All required mechanical interfaces are already provided.

With regard to mechanical endurance, the circuit breaker meets the requirements of Class M2 (10,000 mechanical operating cycles) and is suitable for fast automatic reclosing with the rated operating sequence O-0.3 s-CO-3 min-CO.

In terms of electrical endurance, it complies with the requirements of Class E1, meaning that during type testing it successfully passed the terminal short-circuit tests for its rated short-circuit breaking current of 20 kA in accordance with DIN EN IEC 62271-100.

Equipment

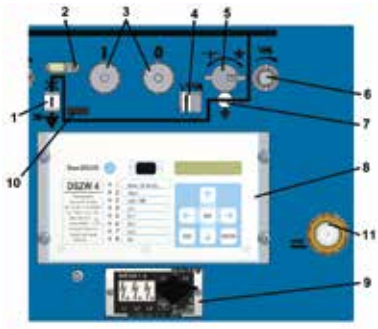
- Available control voltages (motor, trip units): DC 24, 48, 60, 110 V; AC 230 V
- Shunt trip release
- Undervoltage release
- Auxiliary switches for remote indication
- Low-energy magnetic trip release
- Blocking device for manual operation (optional

Operation – circuit breaker and earthing

Circuit-breaker panel T4

The spring-charged operating mechanism of the circuit breaker is charged either manually using a crank or motor-driven. For manual charging, the hand crank must be inserted into opening (6). Attention: When motor operation is used, the spring is automatically recharged immediately after each switching operation. This ensures that the circuit breaker is always capable of completing a full switching cycle. The spring status is indicated at (4). When fully charged, the spring-charged mechanism stores sufficient energy for three individual switching operations, whereby the final possible operation must always be an opening operation. This safety-critical function is automatically ensured by the mechanical design of the operating mechanism. Closing and opening operations are carried out using pushbuttons (3). The switching position of the circuit breaker is indicated at (1). The number of switching operations performed is recorded by an operation counter (10).

The operating openings are mechanically interlocked against each other without force. The ON and OFF pushbuttons can optionally be fitted with a locking device, allowing them to be secured with a padlock. Cable earthing is always performed via the circuit breaker. First, the circuit breaker must be switched OFF. Only then can the selector switch (5) be changed from "busbar" to "earth" using the hand crank of the spring-charged mechanism. The position of the selector switch is shown at (7).
After verifying the absence of voltage in accordance with the five safety rules, the circuit breaker (3) can be switched ON again. Only then is the cable effectively earthed.



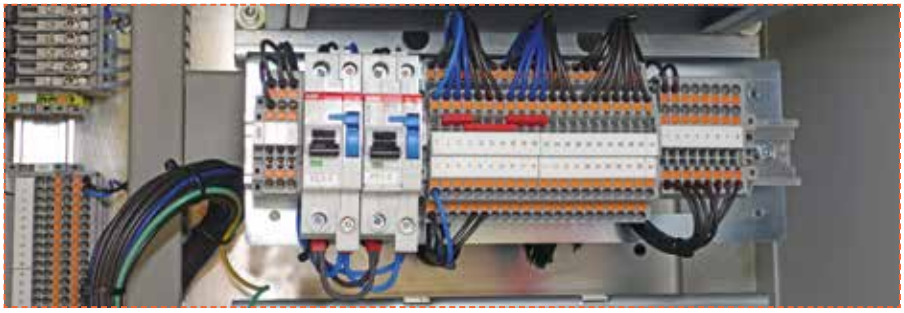
1. Position indicator for ON/OFF switch
2. Pre-selector safety valve (5) locked in ON position
3. ON/OFF operating button for circuit breaker (optional: lockable with padlock)
4. Spring charge indicator
5. Pre-selector operating mechanism
6. Manual spring charging (main spring)
7. Pre-selector position indication (busbar / earthing)
8. Option: electronic protective relay
9. VDS capacity voltage indication (in accordance with EN 61243-5) on the cable side
10. Mechanical operation counter
11. Insulating fluid level indicator (sight glass)

Busbar connection T0

This panel type contains neither a circuit breaker with vacuum interrupter nor the associated operating mechanism.
Inside the pole tubes, the busbar is routed through with the same cross-section.

Medium-voltage protection systems

A wide range of protection systems from different manufacturers and of various types can be integrated into the ECOS-Z circuit-breaker system. Higher-end protection systems are installed in an elevated secondary compartment, which can be dismantled for transport of the switchgear. The front door of this add-on compartment opens upwards and is locked in the open position. This allows clear, well-organized wiring and the installation of test terminals, precisely in accordance with customer specifications. The secondary compartment can also accommodate a UPS, local/remote selector switches, or other control and remote-control components. As a result, additional remote-control cabinets within the substation may not be required.



Indication and measuring devices

For the installation of various protection and indication devices, sufficient space is provided in the operating front of each panel. Protection relays up to size RN1 can be installed, such as SEG WIC1, Kries IKI-35, and NSE Digisave.

Voltage testing system

To verify the absence of voltage on the cables (busbars), a voltage testing system from Horstmann or Kries can be installed directly in the operating front.
Additional types are available upon request.

Cable short-circuit / earth-fault indicato

The use of these simple devices reduces network outage times by enabling rapid localization of the fault.
Various manufacturers (e.g. Kries, Sprecher, Horstmann, etc.) and types are available, with or without auxiliary power supply.

Transformer protection

Transformers are reliably protected by a protection relay in the event of overload and short circuit. Selectivity with the protection device on the low-voltage side can also be adjusted.

As standard, the current-transformer-supplied transformer monitor IKI-35 (manufacturer Kries) is installed. With this device, tripping of the circuit breaker is performed via a low-energy magnetic release. Additional manufacturers and types are available upon request.

Measuring devices

If no protection device needs to be installed in the operating front of the respective switchgear panel (e.g. T0), this space can be used for measuring instruments, such as ammeters (see figure).

Current and voltage transformers / sensors

Inductive current transformers and voltage transformers

In the base section of the switchgear, a metal mounting plate is installed as standard. This plate allows single-pole, cable-mounted toroidal current transformers of various manufacturers and sizes to be installed, in accordance with the requirements of the protection or measuring system.
For the installation of single-pole, touch-safe, enclosed, pluggable voltage transformers, a designated space is provided in the rear section of the base compartment. The voltage tapping is taken from a cable connector in the cable connection compartment and connected to the voltage transformer using single-phase cables with plug-in contacts.

Current transformer installation

Voltage transformer installation

Current and voltage sensors

As an alternative to conventional inductive current and voltage transformers, various sensor solutions can also be used. The current sensors are installed in the cable connection compartment, similar to current transformers. Depending on the application, phase-current sensors or earth-fault detection sensors are used.
At the rear of the T-connectors on the outgoing cables, resistive voltage sensors can be installed instead of the terminating plugs

Current sensor
(example: Zelisko)

Voltage sensor
(example: RSCA, manufacturer TML)

Cable connection

The installation depth is designed as standard for the installation of elbow connectors or resistive voltage dividers. Only plug-in cable terminations in accordance with DIN 47636, outer cone type, may be used.

To prevent multi-pole arc faults also in the cable connection compartment, this area between the cable connectors is equipped with earthed metal partitions. These partition plates are designed per panel and per pole and are installed after the cable connections have been mounted.

For easier cable installation, the front frame of the switchgear can be partially removed (see illustration).

Elbow-type cable connectors and RSCA resistive voltage divider

Sheet-metal partition per pole, shown without cover plat

Cable testing

If cable testing is required on the installed connectors, the front frame can be easily removed to create sufficient space for the connector-specific test equipment.

The connected cables may be subjected, without disconnection, to a test voltage Uct (AC) of 24 kV, 50 Hz for 1 minute, with the vacuum interrupter switched off and the busbar energized.

For improved graphical clarity, the panel and pole partitions are not shown in the illustrations. However, they do not need to be removed in order to carry out the corresponding cable testing.

Use in transformer substations

The ECOS-Z switchgear is designed in such a way that the occurrence of high-current, multi-pole internal arc faults within the system, including the cable connection compartment, is structurally excluded. Accordingly, there is no risk of a measurable pressure rise, which has been confirmed by corresponding tests. For this reason, the internal arc fault risk for this switchgear can be considered negligible.

Consequently, an Internal Arc Classification (IAC) in accordance with DIN EN IEC 62271-200:2025-06, Section 9.103.4, is not required for this switchgear. It may therefore be used in factory-built substations without IAC qualification in accordance with DIN EN IEC 62271-202:2024-03, Section 9.104.4.

The worst-case scenario under all conceivable conditions is therefore an earth fault. In isolated or resonant-earthed networks—which account for approximately 95% of all networks in Germany—such an earth fault does not present a problem.

Example application of the ECOS-Z in a transformer substation

- The number of required outgoing feeders can be increased by interconnecting multiple ECOS-Z switchgear units via cable links. In doing so, the rated busbar current of 630 A must not be exceeded.
- IAC classification of the substation building is not required.
- Suitable for walk-in and non-walk-in substations.
- Easy transport and handling.

Fig. left: ECOS-Z shown in a walk-in substation,
Fig. right: non-walk-in substation

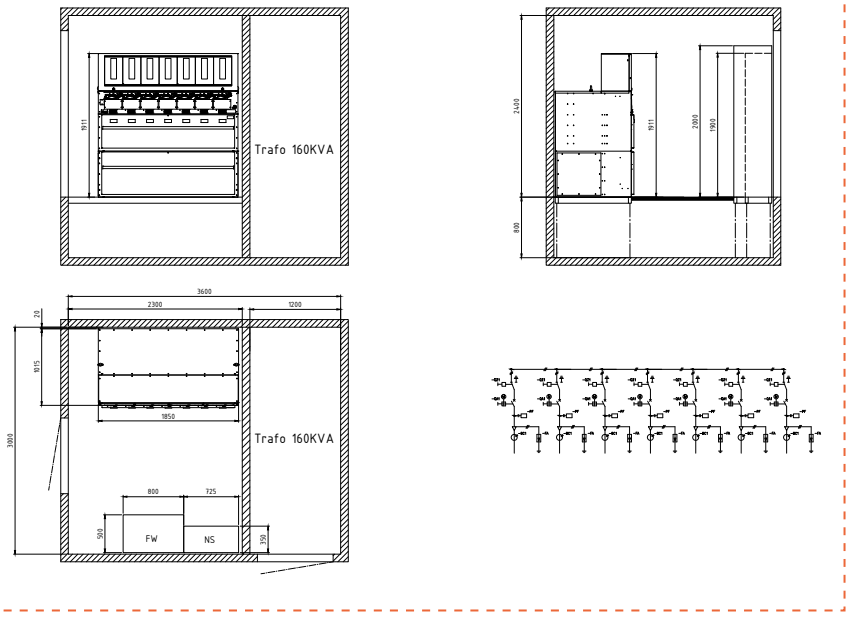


Fig.: Example: walk-in substation with 7-panel ECOS-Z including single-line diagram

ECOS-Z

SF_6-free.
Since ever.

SF_6-free
a future without compromise

Arc fault–free
phase errors technically eliminated

Compact design
ideal for minimal space requirements (240 mm panel width)

Pressure-free system

Proven technology
in practical use for over 15 years

DRIESCHER

SF6 FREE

ELEKTROTECHNISCHE WERKE
FRITZ DRIESCHER & SÖHNE GMBH
Driescherstr. 3
D-85368 Moosburg
Tel.: +49 8761 681-0
E-Mail: infoservice@driescher.de

DRIESCHER GMBH EISLEBEN
Hallesche Str. 94
D-06295 Eisleben
Tel.: +49 3475 7255-0
E-Mail: infoservice-DE@driescher.de

ECOS-Z_en– 04.2026 – V1 – 3-81707891