

Electrification

B105 DUAL GAS GIS FOR DIGITAL SUBSTATIONS

Co-funded by the
European Union



Digital-Native Gas-Insulated Switchgear
245 kV, up to 63 kA, 4000 A
With SF₆ or g³ gas

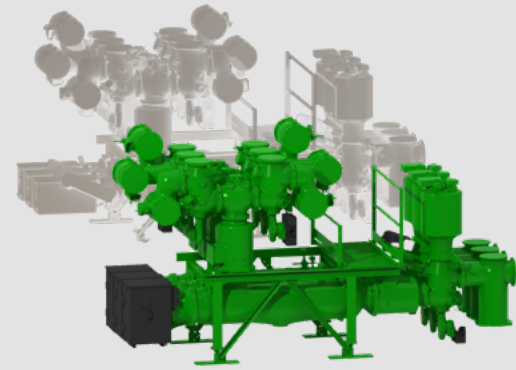
Redefining Digital for High Voltage Primary Equipment

Integrating digital intelligence on primary equipment as close as possible to where signals originate, our Digital-Native High Voltage equipment portfolio is built with quality, precision, performance and reliability in mind. Our expertise in digital solutions for power transmission embedded in our latest hardware, software and security technologies is built to address the most demanding applications, from reactor and power transformer switching to the latest generation of digital substations. With each individual digital-native product being factory-tested as a complete integrated system, we are eliminating on-site troubleshooting operations and reducing commissioning time, delivering an asset ready to connect and operate from day one.

Transitioning to Low Power Instrument Transformers (LPITs)

With low power instrument transformers integrated in a flexible arrangement that still enables installation of conventional CT and VT, the design of our B105 Dual Gas GIS is one of the best solutions to transition to LPIT in digital substations. Compatible with either SF₆ or g³ gas, our B105 Dual Gas GIS meets the challenges of networks up to 245 kV for onshore and offshore power generation and transmission, as well as energy-intensive industry applications, while benefiting from the advantages of LPIT:

- **Safety:** low-energy LPIT sensor outputs and galvanic isolation eliminate the risks usually associated with conventional high-voltage instrument transformers, improving safety for personnel and equipment operation.
- **Configuration:** a single voltage sensor covers the full voltage range from 72.5 kV to 800 kV and a single current sensor can measure from 1 A to 140 kA without consideration of ratio, limiting engineering, procurement, and maintenance only to the configuration of XMU Evolution merging unit.
- **Factory-testing:** as within our entire digital-native equipment portfolio, XMU Evolution is fully integrated and tested in our factories, reducing site activities and ensuring reliable, consistent performance from day one.
- **Redundancy:** our LPIT solutions include sensor, merging unit, and network redundancy, ensuring continuous operation and maximizing substation availability.
- **Flexibility:** as our design accommodates different sensor and redundancy configurations, it can be adapted to the specific needs of each substation.



Accelerating Grid Decarbonization

- B105 for digital substations is part of our GRiDEA portfolio of solutions designed to accelerate the decarbonization of the grid
- The advantages of LPITs include significant reduction of raw materials usually used for conventional CT and VT

The Advantages of our Digital-Native Equipment

- Faster commissioning
- Reduced supply chain complexity
- Improved delivery time
- Connection errors prevention
- Reduced erection and commissioning costs
- Simplified integration into the protection and control scheme through IEC 61850
- Improved flexibility
- Accurate data based on built-in physical sensors that feed Asset Performance Management system

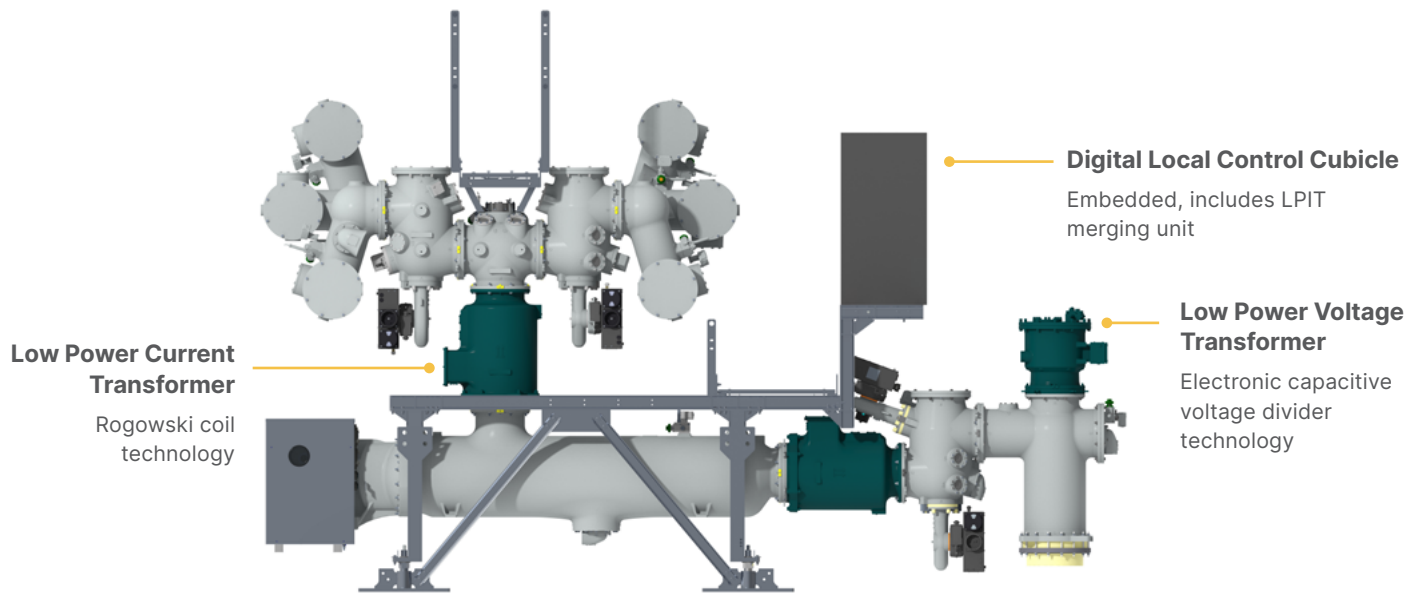
Safety and Cybersecurity

- IEC 62443-4-2 certified
- Authentication, RBAC
- Security events logging, Syslog
- Network segregation, VLAN
- Host hardening
- Software integrity



GE VERNOVA

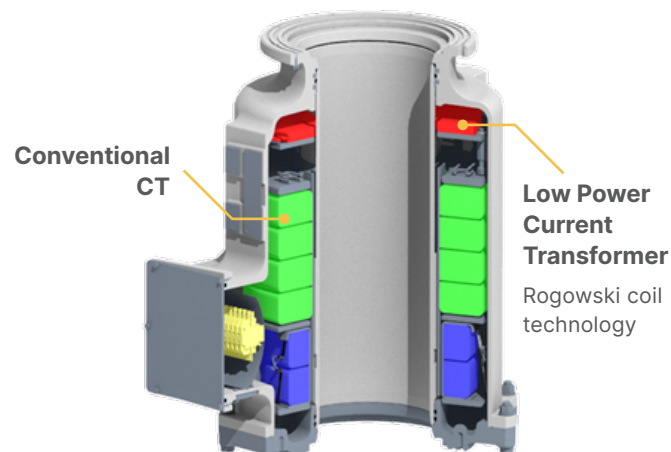
B105 for Digital Substations



Low Power Instrument Transformers (LPIT) with Flexibility to Ease Technology Transition

Current and Voltage measurement on B105 Dual Gas can be conventional and/or digital. With LPITs, the translation from primary to secondary measurement uses Rogowski or capacitive sensors, demonstrating high level accuracy, and high flexibility. The measurement chain is digital, from sensors on primary equipment to the control room, according to IEC 61869.

The first B105 Dual Gas GIS for digital substations, embedding LPIT, was energized in 2019 in a flexible arrangement that enabled to compare the performances of LPIT and conventional technology.



XMU Evolution Merging Unit

XMU Evolution is an advanced merging unit designed for low power current and voltage sensors embedded in GE Vernova's high voltage digital-native gas insulated switchgear and dead tank circuit breakers. Paired with state-of-the-art Rogowski coil and capacitive voltage sensors, our XMU Evolution merging unit deliver high-accuracy and saturation-free measurements across all voltage levels from 72.5 kV to 800 kV.

XMU Evolution supports the acquisition of up to 12 current and/or voltage signals within a cyber secured platform and publishes sampled values over 100 MB and 1 GB redundant network architectures, supporting the core of digital substations.

Fully compliant with IEC 61869 standards, including IEC 61869-9, XMU Evolution supports all common sampled values variants, ensuring compatibility with the most advanced digital substations.



Technical Specifications

SPECIFICATIONS		
General Ratings		
Reference electrotechnical standards	IEC	IEC/IEEE
Voltages	up to 245 kV	up to 245 kV
Insulating and switching gas	g ³	SF ₆
Withstand voltages		
Short-duration power frequency, phase-to-earth/across open switching device	460/530 kV	460/530 kV
Lightning impulse, phase-to-earth/across open switching device	1050/1200 kVp	1050/1200 kVp
Frequency	50 Hz	50/60 Hz
Continuous current	4000 A	4000 A
Short-time withstand current	50 kA	50/63 kA
Peak withstand current	135 kAp	135/170 kAp
Duration of short-circuit	3 s	3 s
Installation	indoor/outdoor	indoor/outdoor
Circuit Breaker Ratings		
Short-circuit breaking current	50 kA	50/63 kA
Short-circuit making current	135 kAp	135/170 kAp
Operating sequence	O-0.3s-CO-3 min-CO/ CO-15s-CO	O-0.3s-CO-3 min-CO/ CO-15s-CO
Drive type	Pure-spring	Pure-spring
Breaking time	<50 ms	<50 ms
Mechanical endurance	M2 class	M2 class
Disconnecter and Low-speed Earthing Switch Ratings		
Capacitive current switching	0.25 A	0.25 A
Bus-transfer current switching capability	2400 A/25 V	2400 A/25 V
Mechanical endurance	M2 class	M2 class
Make-proof Earthing Switch Ratings		
Making current capability	135 kAp	135/170 kAp
Switching capability-electromagnetic coupling	80 A/2 kV	80 A/2 kV
Switching capability-electrostatic coupling	3 A/12 kV	2 A/12 kV
Mechanical endurance	M1 class	M1 class

Gas Data

The functioning of this equipment relies upon SF₆ or a gas mixture based on CO₂/O₂ and 5% of an additive, C₄F₇N (also known as C₄-FN or Iso-C₃F₇CN), a fluorinated greenhouse gas, which helps preserve dimensions and performance equivalent to those of SF₆ equipment while reducing the gas carbon footprint.

	SF ₆	g ³	
		C ₄ F ₇ N additive**	g ³ gas mixture
Average mass of gas/mixture in the equipment (kg)*	127.9	12.8	62.9
GWP100 of gas/mixture (CO ₂ -equivalent)	24,300	2,750	560
CO ₂ -eq of gas/mixture in the equipment (t _{CO₂-eq})*	3,108	35.2	35.2

*For information purposes only considering a typical GIS arrangement (double busbar cable bay). It varies depending on the equipment considered.

** This component's physical properties are essential to g³.

LPIT Merging Unit Data

LPIT INFORMATION	
LPIT Standards	Full compliance with new IEC 61869-1 Ed. 2 2023, IEC 61869-9, Future IEC 61869-7, -8
LPIT Input Isolation	820 V (M12 connector)
LPIT channels	12 channels current or voltage
LPIT Measurement	Protection-measuring (dual rating)/ qualimetry WB1 (3 kHz)
SV measurement accuracy	MU accuracy < 0.05%/3 mn
LPIT dynamic range measurement supported	24 bits digitalization Current: 1 A to 200 kA, Voltage: 10 V to 2 MV
LPIT accuracy class supported	Current: cl. 0.2/5P/5TPE/5TPM for Ir ≥ 100 A Voltage: cl. 0.2/3P for Ur ≥ 2 kV
Sampled Values protocol IEC 61869-9 Variants supported	F4800S2IxUy: Protection-measuring F4000S114U4/F4800S114U4: Protection-measuring 9-2LE F14400S6IxUy: Qualimetry WB1 F12800S8I4U4/F15360S8I4U4: Qualimetry WB1 9-2LE
Redundancy protocol	HSR or PRP (IEC 62439-3)
Time synchronization	Over PTP acc. IEC/IEEE 61850-9-3 (or through 1 pps optical input)

For more information, visit
gevernova.com/electrification