

HLC-12 · SLG-12 · HLXGN-12

Ring Main Units

12 kV · 630 A / 20 kA · IEC 62271-200



Ring Main Units

HLC-12 · SLG-12 · HLXGN-12 · 12 kV · 630 A / 20 kA

Overview

This manual covers the three 12 kV ring main unit ranges HARRL builds for secondary distribution networks: the SF₆ gas-insulated **HLC-12**, the solid-insulated **SLG-12** and the eco-friendly dry-air insulated **HLXGN-12**. All three are unit-type switchgear: standardised functional units combine side by side into whatever ring-network scheme the project single-line diagram calls for.

They share the same electrical envelope — 12 kV, 630 A, 20 kA short-time withstand current — and the same C-type 630 A cable interface to EN 50181, so a network designed around one range can be built with another without redrawing the scheme. What differs is the insulation system, and with it the footprint, the gas handling and the environmental limits. Page 05 compares the three side by side.

The Three Ranges

Each has its own section in this manual

HLC-12 — SF ₆ insulated	C / V / F units, 375 mm wide, switch-fuse option
SLG-12 — solid insulated	Gas-free, PD ≤10 pC, 1800 mm high
HLXGN-12 — dry air insulated	Gas-free, IP67 tank, -40 °C to +60 °C

Reference Standards

Design and routine testing basis

- **GB/T 3906** — AC metal-enclosed switchgear and controlgear for 3.6 kV to 40.5 kV (equivalent to IEC 62271-200)
- **GB/T 1984 / GB/T 1985** — AC circuit-breakers; disconnectors and earthing switches (IEC 62271-100 / -102)
- **GB/T 11022** — Common specifications for high-voltage switchgear (IEC 62271-1)
- **GB/T 3804 / GB/T 16926** — AC switches and switch-fuse combinations, HLC-12 F unit (IEC 62271-103 / -105)
- **DL/T 404 · DL/T 593** — Industry specifications for indoor AC switchgear

Normal Service Conditions

Installation	Indoor; outdoor enclosure available for HLXGN-12
Ambient temperature	-25 °C to +40 °C · HLXGN-12: -40 °C to +60 °C
Altitude	≤ 1000 m *
Relative humidity — daily / monthly	≤ 95 % / ≤ 90 %
Seismic safety factor	≥ 1.67 (0.2 g / 0.1 g), HLXGN-12

* Tailor-made switchgear is available for higher altitudes. For service conditions outside the above, state the site data with the enquiry.

Type Designation

HLC-12	SF ₆ gas-insulated ring main unit, 12 kV
SLG-12	Solid-insulated ring main unit, 12 kV
HLXGN-12	Eco gas (dry air) insulated ring main unit, 12 kV
Unit suffix	Functional unit: C, V, F, PT or D

Choosing a Range

The network interface is the same — the insulation system is not

- All three ranges do the same job at the same ratings. The choice is driven by the site and by how the utility wants to handle insulating gas over the life of the installation.
- **HLC-12** where footprint rules. At 375 mm per unit it is the most compact range we build, and the F unit protects a distribution transformer with a switch-fuse combination instead of a breaker
 - **SLG-12** where no gas at all is acceptable. Solid encapsulation plus vacuum interruption means nothing to monitor, refill or recycle, and the lowest headroom at 1800 mm
 - **HLXGN-12** where the site is harsh or the gas policy is strict but a sealed tank is still wanted: dry air in an IP67 stainless-steel tank, rated from -40 °C to +60 °C

Common to All Three Ranges

Rated voltage / frequency	12 kV / 50 Hz
Rated current, main circuit	630 A
Short-time withstand current	20 kA / 4 s, 50 kA peak
Withstand voltage (1 min / peak)	42 / 48 kV · 75 / 85 kV
Cable interface	C-type 630 A bushing, EN 50181
Switching concept	Three-position switch, sealed drive shaft

Range Comparison

HLC-12 · SLG-12 · HLXGN-12 side by side

Parameter	HLC-12	SLG-12	HLXGN-12
Insulating medium	SF ₆ , 0.045 MPa	Solid encapsulation	Dry air, 0.02 MPa
Arc interruption	SF ₆ switch + vacuum	Vacuum	Vacuum
SF ₆ -free	No	Yes	Yes
Functional units	C / V / F	V / PT	V / PT / D
Transformer protection	Switch-fuse or breaker	Circuit-breaker	Circuit-breaker
Partial discharge	≤ 20 pC	≤ 10 pC	≤ 10 pC
Gas tank / enclosure protection	IP67 / IP4X	— / IP4X	IP67 / IP4X
Gas leakage rate per year	≤ 0.05 %	None	≤ 0.01 %
Gas monitoring	Manometer per tank	Not required	Manometer per tank
Ambient temperature	-25 to +40 °C	-25 to +40 °C	-40 to +60 °C
Mechanical life, breaker	10 000 ops	20 000 ops	20 000 ops
Unit width, breaker panel	375 mm	420 mm	420 mm
Unit depth × height	750 × 1950 mm	810 × 1800 mm	850 × 2000 mm
Internal-arc design criteria *	20 kA / 1 s	20 kA / 1 s	20 kA / 1 s

* Internal-arc figures are the design criteria to GB/T 3906 / IEC 62271-200 (IAC AFLR); they are stated as the design basis of the enclosure and pressure-relief system, not as a type-test classification.
** The HLC-12 F unit is rated 125 A; its rated current depends on the selected HV fuse. All other panels are 630 A.

One scheme, three builds

Ratings and cable interface are identical, so the same ring-network scheme can be quoted in any of the three ranges.

Typical Duty

Ring main network	Cable in / out plus one or more feeders
Distribution substation	Transformer protection by breaker or switch-fuse
Compact substation	Prefabricated and packaged substations

HLC-12 — SF₆ Gas-Insulated

Compact 375 mm units, switch-fuse transformer protection

- Primary circuits sealed in a stainless-steel gas tank, protection IP67, annual leakage rate ≤ 0.05 %
- Uniform 375 mm unit width — a complete four-unit board is under 1.6 m wide, so a whole ring-network switchboard fits a compact substation
- Three standardised units — C (load-break switch), V (vacuum circuit-breaker) and F (switch-fuse combination) — all the same size, so any scheme is built from identical blocks
- The F unit protects a distribution transformer economically: breaking capacity 31.5 kA in combination with the HV fuse, rated transfer current 1400 A
- Dedicated pressure-relief channel vents gas away from the operator under internal arcing
- Block design supports single-tank or common-tank combination per project

Functional Units

C — cable load-break switch unit	375 × 750 × 1950 mm
V — vacuum circuit-breaker unit	375 × 750 × 1950 mm
F — switch-fuse combination unit	375 × 750 × 1950 mm

Gas management

Rated SF₆ pressure 0.045 MPa, alarm pressure 0.02 MPa (20 °C gauge). Every tank carries a manometer; a version with low-pressure warning contacts is available.

HLC-12 — Rated Parameters

C / V / F functional units

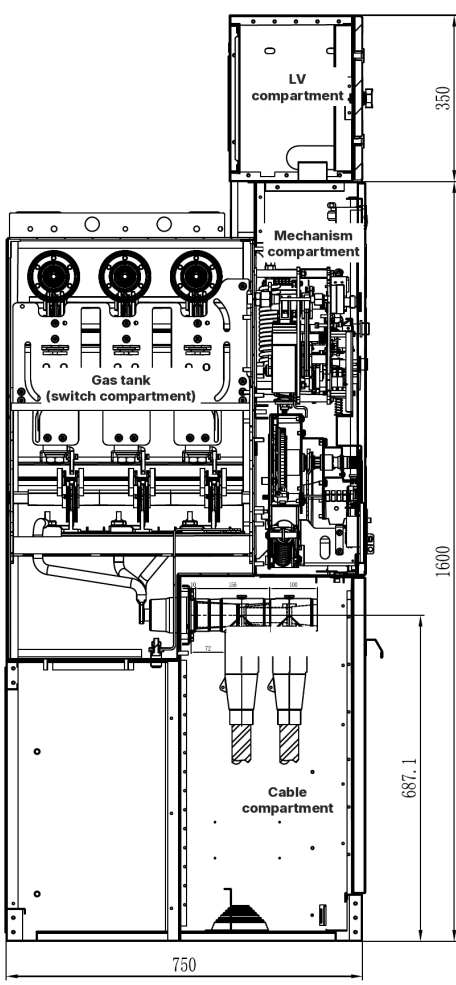
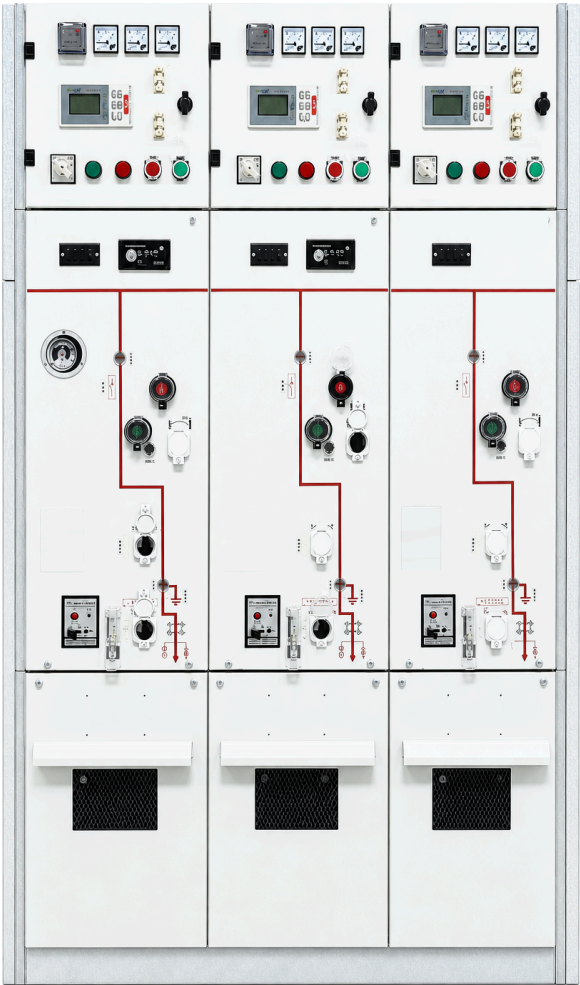
Parameter	Unit	C panel	V panel	F panel
Rated voltage / frequency	kV / Hz	12 / 50	12 / 50	12 / 50
Power-frequency withstand (1 min)	kV	42 / 48	42 / 48	42 / 48
Lightning impulse withstand (peak)	kV	75 / 85	75 / 85	75 / 85
Rated current, main circuit	A	630	630	125 **
Short-time withstand current (4 s)	kA	20	20	—
Rated peak withstand current	kA	50	50	80
Rated short-circuit breaking current	kA	—	20	31.5 ***
Rated short-circuit making current (peak)	kA	50	50	80
Rated transfer current	A	—	—	1400
Rated operating sequence	—	—	0-0.3s-C0-180s-C0	—
Earthing-switch making current (peak)	kA	50	50	—
Internal-arc design criteria (IAC AFLR) *	kA / s	20 / 1	20 / 1	20 / 1
Partial discharge	pC	≤ 20	≤ 20	≤ 20
Mechanical life — switch / isolator / earthing	ops	5000 / 3000	10000 / 3000 / 3000	5000 / 3000
SF ₆ rated / alarm pressure (20 °C)	MPa	0.045 / 0.02	0.045 / 0.02	0.045 / 0.02
Gas leakage rate per year	V/V	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %
Gas tank / enclosure protection	IP	IP67 / IP4X	IP67 / IP4X	IP67 / IP4X
Auxiliary circuits — voltage / withstand	V · kV	24-220 / 2	24-220 / 2	24-220 / 2
Unit dimensions W × D × H	mm	375 × 750 × 1950	375 × 750 × 1950	375 × 750 × 1950

* Internal-arc figures are the design criteria to GB/T 3906 / IEC 62271-200 (IAC AFLR); they are stated as the design basis of the enclosure and pressure-relief system, not as a type-test classification.

** Fused circuit to GB/T 16926 / IEC 62271-105; the rated current depends on the selected HV fuse.

*** Breaking capacity of the switch-fuse combination together with the HV fuse.

HLC-12 — Switchboard and V Panel Sectional View



Three-unit ring main switchboard
Fig. 1 — Gas tank, mechanism compartment, LV compartment and cable compartment

Product Structure

The switchgear is built from standardised functional units sharing a fully sealed gas tank. A single unit can be used stand-alone with a side-merging busbar, or several units combined through side, top or mixed buscouple to form a complete ring-network board. The three-position switch is operated through a sealed shaft — no live part is exposed during any operation.

HLC-12 — Typical Single-Line Schemes

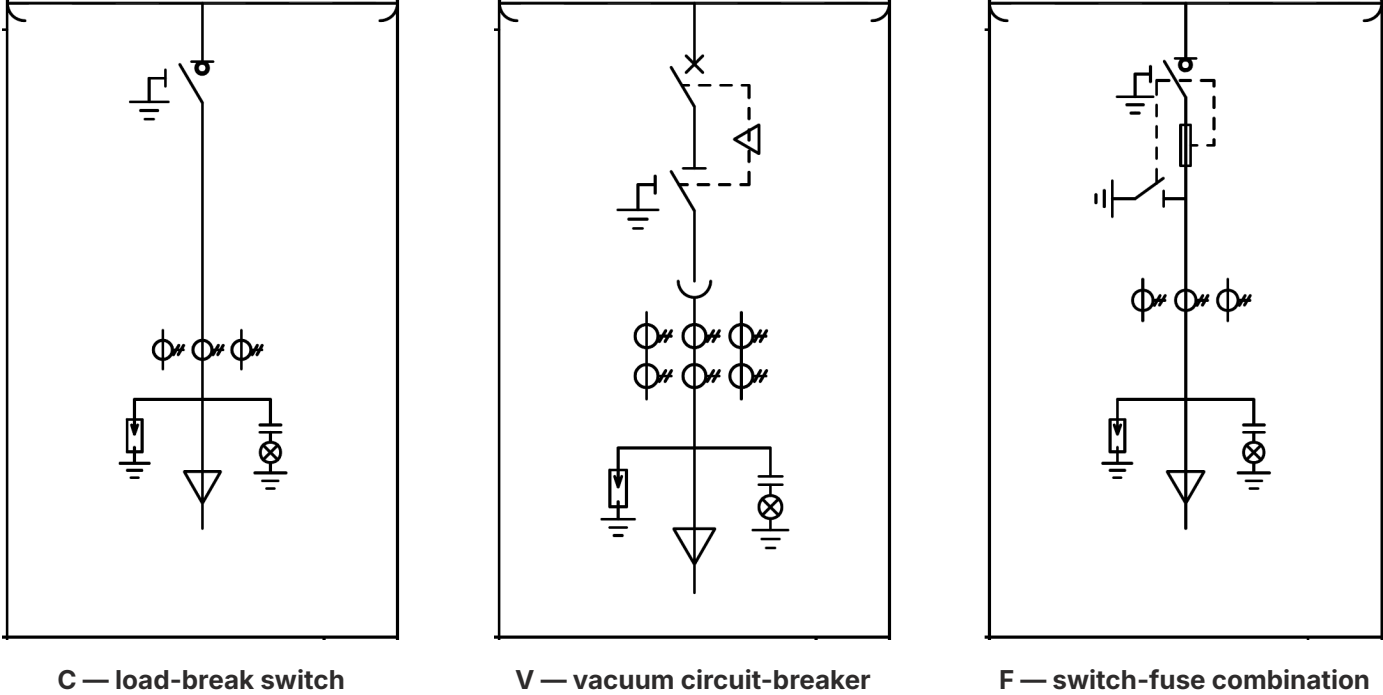


Fig. 2 — Other unit combinations are produced to the project single-line diagram

Scheme Units

Typical units combine freely into the required scheme

C — cable load-break switch	Ring cable in / out, 630 A
V — vacuum circuit-breaker	Feeder or transformer protection with relays
F — switch-fuse combination	Economical distribution-transformer protection

Operation and Interlocking

- Mechanical and electrical interlocking prevents mis-operation; the three-position switch (closed / open / earthed) is driven through a sealed shaft
- Side, top or combined busbar connection; block design for single or common gas-tank combinations
- C-type 630 A cable bushings to EN 50181 accept European shielded plug-in terminations

SLG-12 — Solid Insulated

No insulating gas of any kind, from production to disposal

- Primary circuits fully encapsulated in solid insulating material with an earthed outer shield — clearances are independent of air condition
- Vacuum interruption for both the circuit-breaker and the three-position switching device: entirely SF₆-free through production, service and recycling
- Partial discharge of the complete unit ≤ 10 pC — a quiet insulation system with slow ageing and long electrical life
- No gas system means no manometer, no density relay and no refilling: the primary insulation is genuinely maintenance-free
- Compact 420 mm unit width and 1800 mm height suit low-headroom rooms and compact prefabricated substations
- Earthed shielding over the insulated primary circuit protects operators from accidental contact

Functional Units

V — vacuum circuit-breaker unit	420 × 810 × 1800 mm
PT — voltage transformer unit	600 × 810 × 1800 mm

Why solid insulation

With no insulating gas, performance is unaffected by humidity, condensation or gas ageing; the switchgear stays maintenance-free from commissioning to end of life, and end-of-life disposal is straightforward.

SLG-12 — Rated Parameters

V and PT functional units

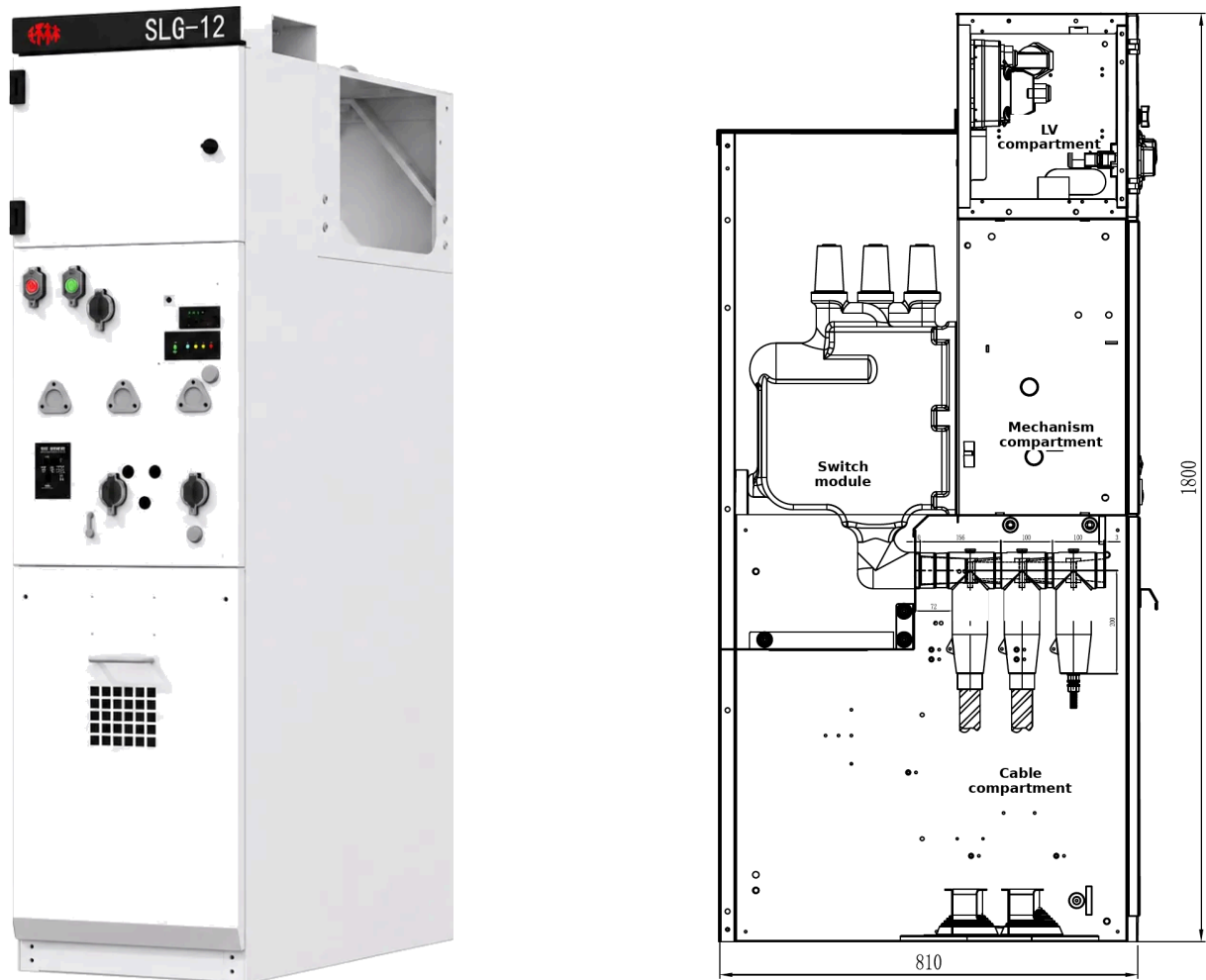
Parameter	Unit	V panel	PT panel
Rated voltage / frequency	kV / Hz	12 / 50	12 / 50
Power-frequency withstand, earth / isolating (1 min)	kV	42 / 48	42 / 48
Lightning impulse withstand, earth / isolating (peak)	kV	75 / 85	75 / 85
Rated current	A	630	630
Short-time withstand current (4 s) / peak	kA	20 / 50	20 / 50
Rated short-circuit breaking current	kA	20	—
Rated short-circuit making current (peak)	kA	50	—
Rated operating sequence	—	0-0.3s-C0-180s-C0	—
Earthing-switch making current (peak)	kA	50	50
Internal-arc design criteria (IAC AFLR) *	kA / s	20 / 1	—
Partial discharge	pC	≤ 10	≤ 10
Mechanical life, breaker / isolator / earthing	ops	20000 / 5000 / 5000	—
Enclosure protection	IP	IP4X	IP4X
Cable interface	—	C-type bushing 630 A	C-type bushing 630 A
Auxiliary circuits — voltage / withstand	V · kV	24-220 / 2	24-220 / 2
Unit dimensions W × D × H	mm	420 × 810 × 1800	600 × 810 × 1800

* Internal-arc figures are the design criteria to GB/T 3906 / IEC 62271-200 (IAC AFLR); they are stated as the design basis of the enclosure and pressure-relief system, not as a type-test classification.

Testing and Quality

SLG-12 is designed and manufactured to GB/T 3906 and IEC 62271-200. Every unit undergoes the full routine test programme before delivery, including a partial discharge measurement against the ≤ 10 pC criterion.

SLG-12 — Unit and V Panel Sectional View

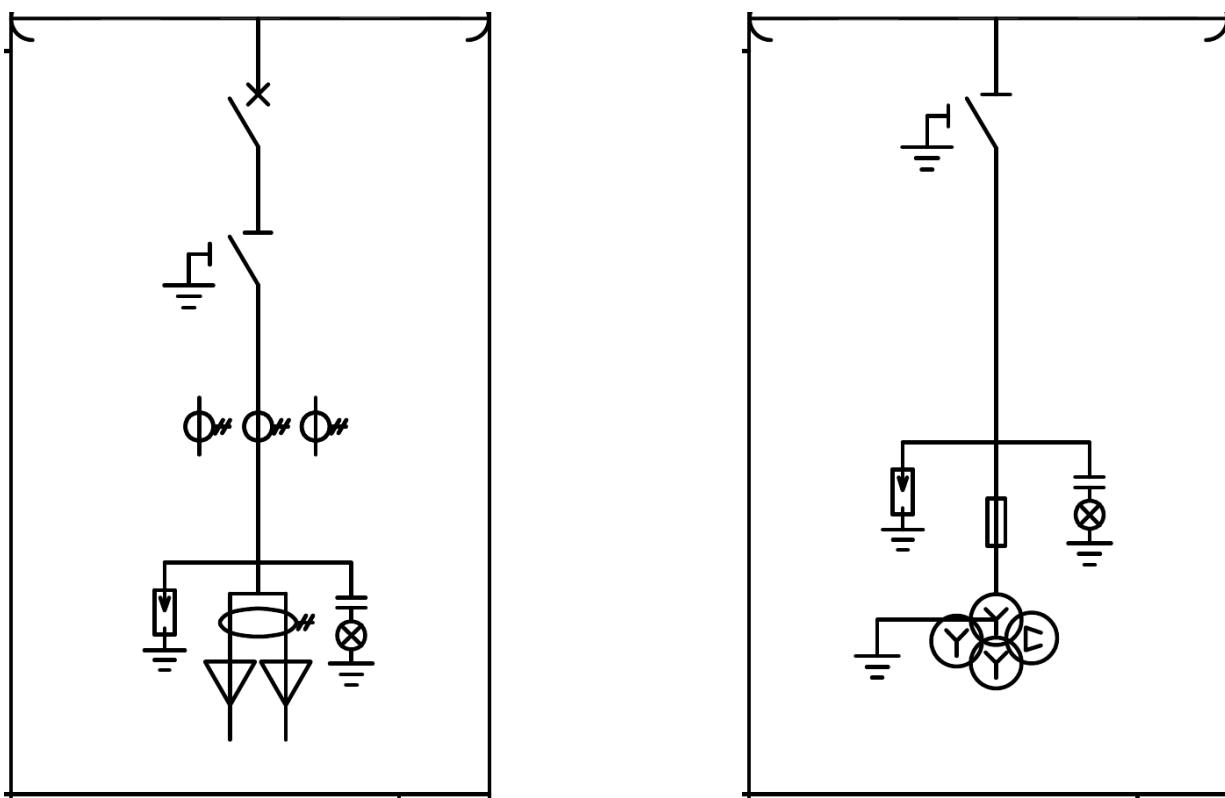


Solid-insulated unit
Fig. 3 — Solid-insulated switch module, mechanism compartment and cable compartment

Product Structure

The switchgear is built from standardised solid-insulated functional units. A single unit can be used stand-alone with a side-merging busbar, or several units combined through side, top or mixed buscouple into a complete ring-network board. The three-position switch (closed / open / earthed) is operated through a sealed drive.

SLG-12 — Typical Single-Line Schemes



V — vacuum circuit-breaker panel
PT — voltage transformer panel
Fig. 4 — Other unit combinations are produced to the project single-line diagram

Scheme Units

V — vacuum circuit-breaker panel	Incoming, feeder or transformer circuit
PT — voltage transformer panel	Voltage measurement, with HV fuse

Operation and Interlocking

- Mechanical and electrical interlocking prevents mis-operation
- Earthed shielding over the insulated primary circuit — no live part is exposed during any operation
- C-type 630 A cable bushings to EN 50181 accept European shielded plug-in terminations

HLXGN-12 — Dry Air Insulated

A sealed tank without SF₆, rated from −40 °C to +60 °C

- Dry air replaces SF₆ as the insulating medium and both the circuit-breaker and the three-position isolating / earthing switch use vacuum interruption — SF₆-free in production, service and recycling
- 3 mm 304 stainless-steel tank, laser cut and welded, withstands 0.3 MPa; protection IP67 and an annual leakage rate ≤ 0.01 %
- Full-automatic helium leak check and dry-air charging, dry-air purity 99.99 %, design service life 40 years
- A drop-in alternative to SF₆-insulated and solid-insulated cabinets of the same duty and rating
- Unattended substation operation supported by temperature-rise, density, current and voltage monitoring
- Side, top or combined busbar connection; extended busbar totally enclosed with earthed conducting paint

Functional Units

V — vacuum circuit-breaker unit	420 × 850 × 2000 mm
PT — voltage transformer unit	600 × 850 × 2000 mm
D — direct cable-in unit	To project single-line diagram

HLXGN-12 — Rated Parameters

V and PT functional units

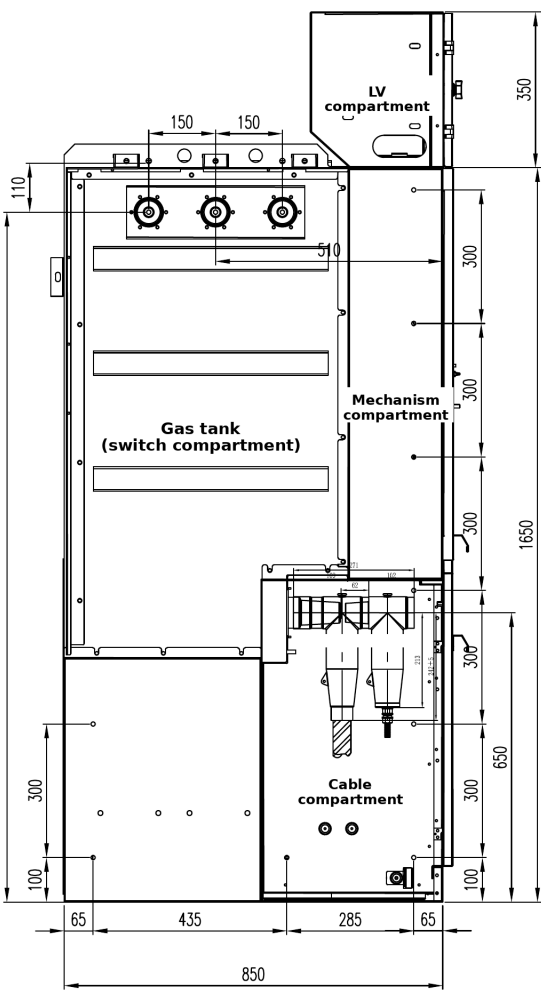
Parameter	Unit	V panel	PT panel
Rated voltage / frequency	kV / Hz	12 / 50	12 / 50
Power-frequency withstand, earth / isolating (1 min)	kV	42 / 48	42 / 48
Lightning impulse withstand, earth / isolating (peak)	kV	75 / 85	75 / 85
Rated current	A	630	630
Short-time withstand current (4 s) / peak	kA	20 / 50	20 / 50
Rated short-circuit breaking current	kA	20	—
Rated short-circuit making current (peak)	kA	50	—
Rated operating sequence	—	0-0.3s-C0-180s-C0	—
Earthing-switch making current (peak)	kA	50	50
Internal-arc design criteria (IAC AFLR) *	kA / s	20 / 1	—
Partial discharge	pC	≤ 10	≤ 10
Mechanical life, breaker / isolator / earthing	ops	20000 / 5000 / 5000	—
Insulating gas · rated / alarm pressure (20 °C)	MPa	Dry air · 0.02 / 0.01	Dry air · 0.02 / 0.01
Gas leakage rate per year	V/V	≤ 0.01 %	≤ 0.01 %
Gas tank / enclosure protection	IP	IP67 / IP4X	IP67 / IP4X
Auxiliary circuits — voltage / withstand	V · kV	24-220 / 2	24-220 / 2
Unit dimensions W × D × H	mm	420 × 850 × 2000	600 × 850 × 2000

* Internal-arc figures are the design criteria to GB/T 3906 / IEC 62271-200 (IAC AFLR); they are stated as the design basis of the enclosure and pressure-relief system, not as a type-test classification.

Outdoor distribution substation

An outdoor substation can be formed with an outdoor enclosure (IP44, head inclination ≥ 5°, dedicated earthing conductor). Ambient +40 °C, option +55 °C; minimum −10 °C, option −25 °C.

HLXGN-12 — Switchboard and V Panel Sectional View

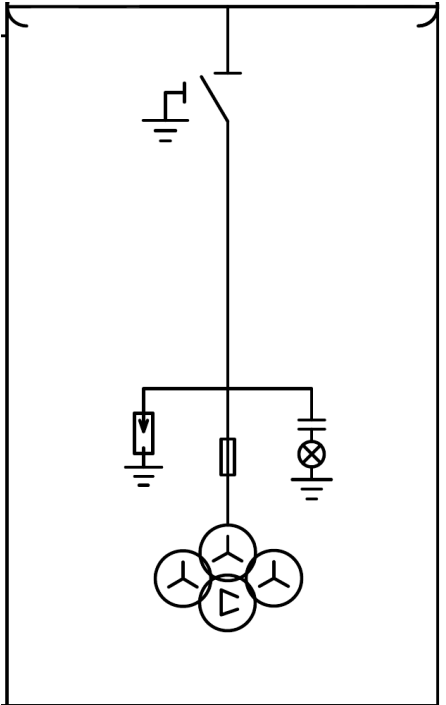
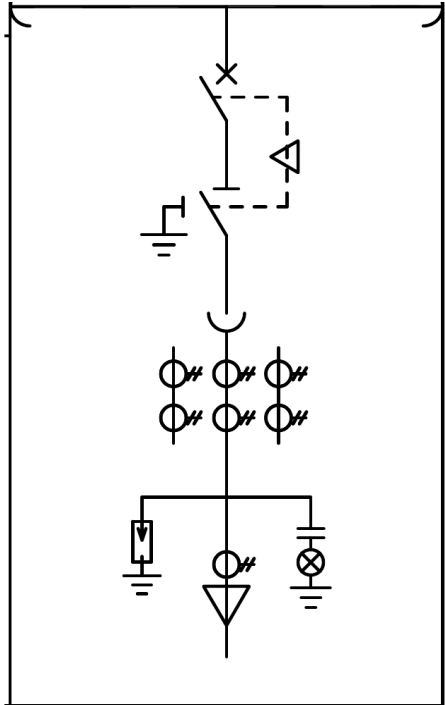


Three-unit ring main switchboard
Fig. 5 — Gas tank, mechanism compartment, LV compartment and cable compartment

Core Components

Upper-isolator and lower-isolator switching schemes are available inside the gas tank. The three-position switch (closed / open / earthed) is driven through a sealed shaft — no live part is exposed during any operation.

HLXGN-12 — Typical Single-Line Schemes



V — vacuum circuit-breaker panel
PT — voltage transformer panel

Fig. 6 — Full scheme sheets, including the D direct cable-in unit, are available on request

Scheme Units

V — vacuum circuit-breaker panel	Upper or lower isolator arrangement
PT — voltage transformer panel	Voltage measurement, with HV fuse
D — direct cable-in panel	Cable entry without switching device

Extended Service Conditions

Maximum daily temperature range	25 K
Maximum wind velocity	35 m/s (10 min average)
Mechanical load capability	10 mm icing / 17.5 m/s wind
Induced interference in secondary system	≤ 1.6 kV

Components and Accessories

Common to all three ranges unless noted

- **Cable termination** — C-type bushings to DIN 47636 and EN 50181 (interface C, M16 × 2); European shielded terminations recommended
- **Voltage indication (VPIS)** — presentation type, or forced-locking type with locking contact
- **Voltage transformers** — conventional or cable-plug type; the PT panel can also house a station-service transformer with output up to 3 kVA
- **Current transformers** — open-core, ring-core or racetrack-core types per project
- **Interlocking** — mechanical and electrical interlocks; electromagnetic lock and mechanical key interlocks (“two locks one key”, “three locks two keys”)
- **Motorised operation** — load-break switch and breaker spring charging, retrofittable; 85–110 % Un motor and closing coil, 65–120 % Un opening coil
- **Low-voltage compartment** — standard height 450 mm, houses relays, meters and secondary components

Protection and Monitoring

- Self-powered protection relays for sites without an auxiliary supply, or integrated relays with three-step current, overload, reclosing, earthing and zero-sequence over-voltage protection
- Combined short-circuit and earth-fault indicator, minimum earth-fault current 20 A, in each network branch for rapid fault location
- Distribution automation interface for DTU / FTU: 24 remote measurements, 4 × 20 remote communication and 3 × 12 remote control signals over optical fibre, audio cable or GPRS / CDMA

What to Specify

Send this with the enquiry and we quote a board, not a guess

- Single-line diagram of the primary scheme and the arrangement of the functional units
- Rated parameters of each unit: current, breaking capacity, fuse rating, CT / PT ratio and accuracy class
- Cable type and quantity per phase, and the selected cable termination system
- Configuration of protection relays, indicators, VPIS and interlocking schemes
- Operating environment — indoor or outdoor, altitude, temperature — and any gas policy that rules a range in or out
- Accessories, spare parts and any signals to be wired to a control system

Scope of Supply

Standard	Functional units, busbar connection, devices and internal wiring
Tested	Full routine test programme in our works before delivery
Documents	General arrangement, scheme drawing, test records
Not included	Power and control cables, site earthing, civil works

Routine testing

Every unit undergoes the full routine test programme before delivery — including gas-tightness checking on HLC-12 and HLXGN-12, and a partial-discharge measurement against the ≤ 10 pC criterion on SLG-12.

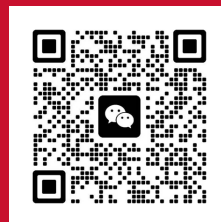
The ownership of the version belongs to Jiangxi HARRL Group Co., Ltd. and all rights are reserved to the extent permitted by law. Due to product development and technical improvements, the actual products sold may differ from those shown in this brochure, and the company reserves the relevant right.



Web: harrlgroup.com
Email: sales@harrlgroup.com
Tel / WhatsApp: +86 183 7998 3771
Address: No. 388 Quanshun Road, Nanchang County,
Nanchang, Jiangxi, China



Scan for WhatsApp



Scan for WeChat