

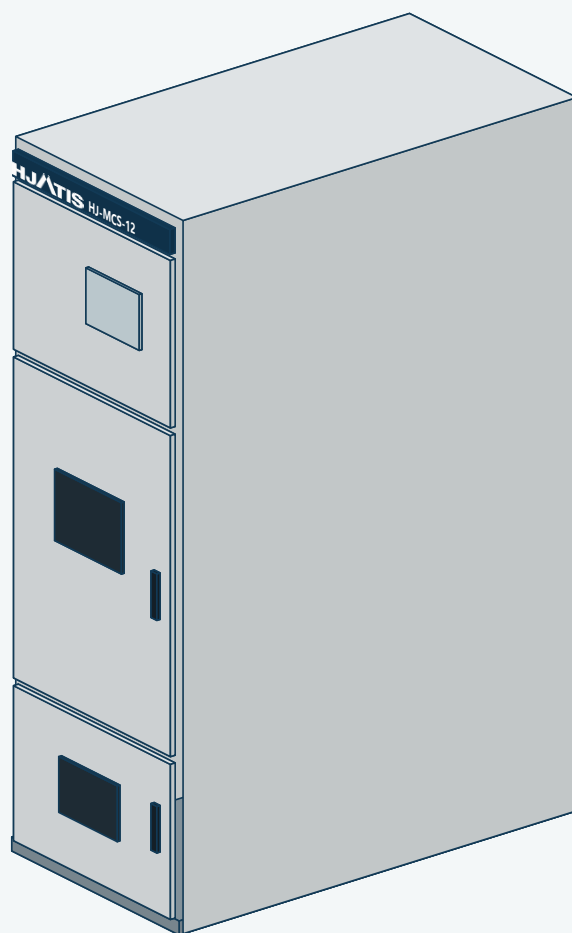
USER MANUAL

HJ-MCS-12

Series Metal-Clad Switchgear

Installation | Operation | Maintenance | Transport

Chinese (GB) model: **KYN28A-12/1250-31.5**



HJATIS POWER

HJATIS POWER INDUSTRY CO., LTD.

English | Rev B | September 2026

HJ-MCS-12-IOM-EN

01 | SCOPE AND IDENTIFICATION

Using this manual

Product identification	Designation
Website product name	HJ-MCS-12 Series Metal-Clad Switchgear
Chinese (GB) model	KYN28A-12/1250-31.5
Manufacturer	HJATIS POWER INDUSTRY CO., LTD.
Brand	HJATIS POWER

GB product name: Armoured withdrawable AC metal-enclosed switchgear.

国标名称：铠装移开式交流金属封闭开关设备。

Purpose and authorised users

For trained, qualified and authorised personnel receiving, installing, testing, operating and maintaining the identified GB configuration. Read the safety and task chapters before work.

Engineering illustrations

Figures identify functions and inspection locations; they are not fabrication drawings. Do not scale installation holes, clearances, travel or lifting points from a perspective view.

Supporting documents

Use the delivered arrangement, foundation, primary, earthing and secondary drawings; component instructions; protection settings; and site work-permit and switching procedures.

Document control

Check unit nameplates before connection or replacement. Retain current records and update drawings after approved changes. Stop affected work if documents, indications or hardware disagree.

Equipment registration - example administrative entries

Register item	Entry	Register item	Entry
Panel ID	MCS12-01	Drawing issue	GA-M12-A
Reference serial	HJP-M12-260215-001	Registered	15 February 2026
Breaker series	HJ-VCB-12/24	Custodian	Product Department

Administrative entries above identify this manual example. The actual unit nameplate and approved configuration govern equipment identity and replacement.

01 | SCOPE AND IDENTIFICATION

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Safety essentials

DANGER - High voltage and arc hazards

Contact with live parts or exposure to an arc can cause death, severe burns or equipment destruction. Work inside the panel requires effective isolation, proving dead, earthing and a valid work permit.

People and work control

Work shall be performed by personnel with the required training, competence and authorisation. Identify the task, equipment, work limits, supervisor, communication arrangements and responsible switching authority.

Select personal protective equipment, voltage detectors, insulating equipment and barriers through the site risk assessment. An enclosure IP rating does not establish arc protection or safe approach distances.

Preserve the enclosure

Keep doors, covers, partitions and protective parts closed, complete and secured during operation. Do not drill new holes, alter pressure-relief parts or defeat protective barriers.

WARNING - Interlocks are not a work permit

A mechanism that can move is not necessarily safe or authorised to operate. Never bypass, tie back, cut, short-circuit or force an interlock.

Prohibited practices

1. Do not treat an OPEN indication, test position or an unlit voltage indicator as the sole proof of a dead circuit.
2. Do not force shutters open or reach into primary contacts before the work zone is safely isolated, tested and earthed.
3. Do not repeatedly issue CLOSE commands, reclose after an unexplained trip or force a stalled truck.
4. Do not operate outside the assigned ratings, service conditions and approved operating duty.

First response to danger

If there is smoke, burning odour, discharge noise, panel deformation or abnormal protection operation, keep clear and report the event. Isolation is to be organised by the authorised switching authority. Do not open the panel to investigate.

02 | SAFETY AND ISOLATION

Isolation and residual energy

Identify every source

Consider busbars, outgoing cables, adjacent panels, remote supplies, instrument-transformer circuits, auxiliary supplies, distributed generation and stored energy. Opening the local circuit-breaker alone does not define a safe work zone.

Before work begins

1. Confirm the work permit, panel ID, work limits and all possible sources of backfeed.
2. Isolate the relevant supplies under the approved procedure. Secure against unintended energisation and remote commands.
3. Prove dead, apply earthing and short-circuiting measures, and arrange barriers, signs and supervision as required by the site safety rules.
4. Identify and control spring energy, moving mechanisms and residual electrical charge. Verify the measures before authorising work.

DANGER - Contacts behind shutters

Primary fixed contacts can remain live after the truck is withdrawn. Shutters shield interfaces; they do not prove that those interfaces are dead.

Mechanical stored energy

Disconnecting the control supply may leave a closing spring charged. Follow the fitted mechanism instructions to identify and control stored energy. Do not improvise a discharge sequence by random breaker operation.

Keep hands, clothing and tools clear of guides, engagement zones and moving parts. Support and secure the truck with correctly matched handling equipment.

WARNING - Current-transformer secondary circuits

Never open a CT secondary circuit while primary current can flow. Use the identified test terminals and the approved secondary-circuit safety arrangements. Do not disconnect unknown terminals or improvise links.

After work

Account for personnel, tools and temporary leads. Restore connections, barriers and interlocks and complete the required checks. Removal of earths and restoration of supplies shall form part of the authorised work-closeout and switching procedure.

03 | RATINGS AND SERVICE CONDITIONS

Assigned ratings

KYN28A-12/1250-31.5 is an indoor, three-phase, 50 Hz switchgear configuration for receiving, distributing, controlling and protecting electrical power.

Parameter	Assigned value
Rated voltage	12 kV
Rated current	1250 A
Rated frequency	50 Hz
Rated short-circuit breaking current	31.5 kA
Rated short-circuit making current	80 kA peak
Main-circuit short-time withstand current	31.5 kA
Rated short-circuit duration	4 s
Main-circuit peak withstand current	80 kA peak
Breaker closing / opening coil supply	AC 220 V
Enclosure protection, front doors closed	IP4X
Protection between compartments / front door open	IP2X

GB product technical basis

GB 3906-2006; GB 1984-2014.

Check the actual coil nameplate, auxiliary-device supply and secondary diagram before connection. The breaker coil supply is not the supply specification for every auxiliary circuit.

Breaker rated operating sequence: **O-0.3 s-CO-180 s-CO**. O = opening; CO = closing followed by opening. This describes rated capability, not a normal switching instruction.

03 | RATINGS AND SERVICE CONDITIONS

Insulation and fitted components

Insulation level	Phase / earth	Open breaker contacts / isolating gaps
Power-frequency withstand, 1 min	42 kV, 1 min	48 kV, 1 min
Lightning impulse withstand, peak	75 kV peak	85 kV peak

Earthing duty / verification	Value
Earthing-switch rated withstand	31.5 kA, 4 s; 80 kA peak
Earth-connecting circuit withstand verification	27.4 kA, 2 s; 69.6 kA peak

Component	Configuration
Breaker product series	HJ-VCB-12/24; 12 kV, 1250 A, 31.5 kA; spring mechanism
Earthing switch	JN15-12/31.5-210; integral manually operated spring mechanism
Current transformer	LZZBJ9-10; 1250/5 A; A and C phases
Main busbar	TMY-80 × 10 mm

Primary resistance limits: main circuit $\leq 150 \mu\Omega$; breaker $\leq 60 \mu\Omega$, using the specified test points, connection method and test conditions.

WARNING - Site test settings

Rated insulation levels are not site test settings. Apply the approved test procedure and protect or disconnect affected CTs, surge arresters, electronic devices and auxiliary circuits before testing.

03 | RATINGS AND SERVICE CONDITIONS

Service conditions and interfaces

Condition	Requirement
Installation	Indoor; altitude not exceeding 2000 m.
Ambient temperature	-10 °C to +40 °C.
Relative humidity	Daily average not more than 95%; monthly average not more than 90%.
Seismic environment	Installation-area seismic intensity not exceeding 8 degrees; foundations and restraints to the project design.
Surroundings	No fire or explosion risk, severe vibration, corrosive atmosphere or severe pollution.

Room and moisture control

Keep the room dry, clean and suitably ventilated. Correct roof, wall and cable-trench leakage and remove construction dust before installation or energisation.

Where anti-condensation heaters and controllers are fitted, verify their supply, wiring and settings. After condensation or water exposure, establish the cause, dry and inspect the equipment and complete the necessary tests before return to service.

Unusual service

Consult HJATIS POWER if the location exceeds these conditions or involves salt spray, frequent operation or unusual loads. Reassess suitability after a significant change of environment or duty.

Prepare the project interfaces

1. Confirm the lineup, foundation, door access, truck withdrawal route and maintenance working space.
2. Provide the current primary, busbar, cable, earthing and secondary drawings.
3. Match the breaker, accessories, handling equipment and protection settings to the delivered panel.

Hold point

Foundation holes, clearances, conductor joints, tightening instructions, lifting points, mass and mechanism settings shall follow the delivered drawings and component documents. Resolve a mismatch before the affected work proceeds.

Enclosure dimensions

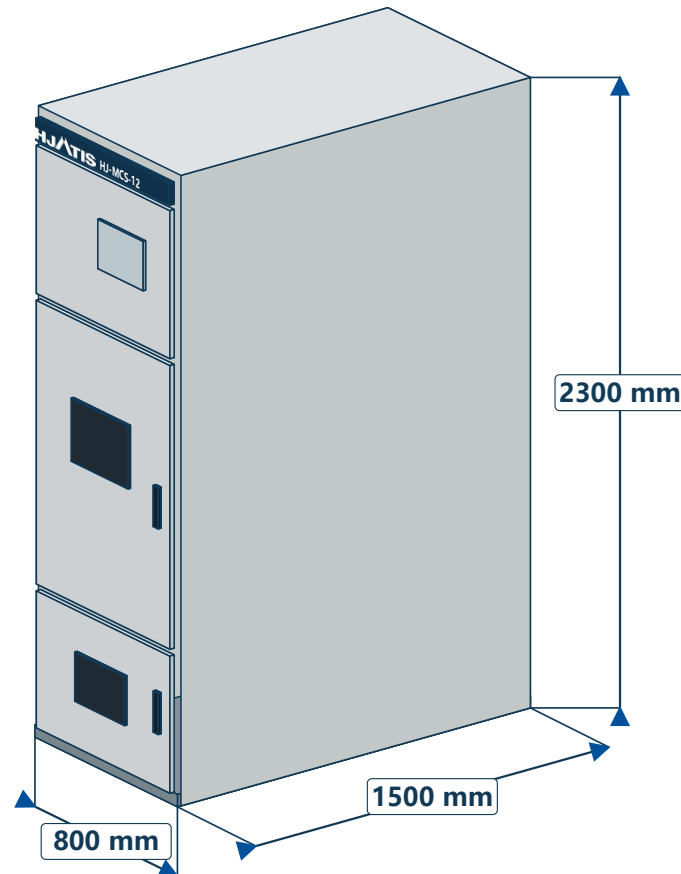


Figure 4-1. Enclosure envelope

Dimensions in mm. W = width; D = depth; H = height.

Configuration	W × D × H (mm)
Standard enclosure	800 ±5 × 1500 ±5 × 2300 ±5

Installation and shipping envelope

Use the exact delivered dimensional combination for the foundation, lineup and access-route checks. Maintain door opening, truck removal and maintenance access, and keep pressure-relief routes unobstructed.

The packed envelope includes the skid, crate and external protection. Check it separately against vehicle capacity, the actual container door opening and every route restriction. Do not tilt an upright-only panel to force it through a restricted opening.

Four-compartment construction

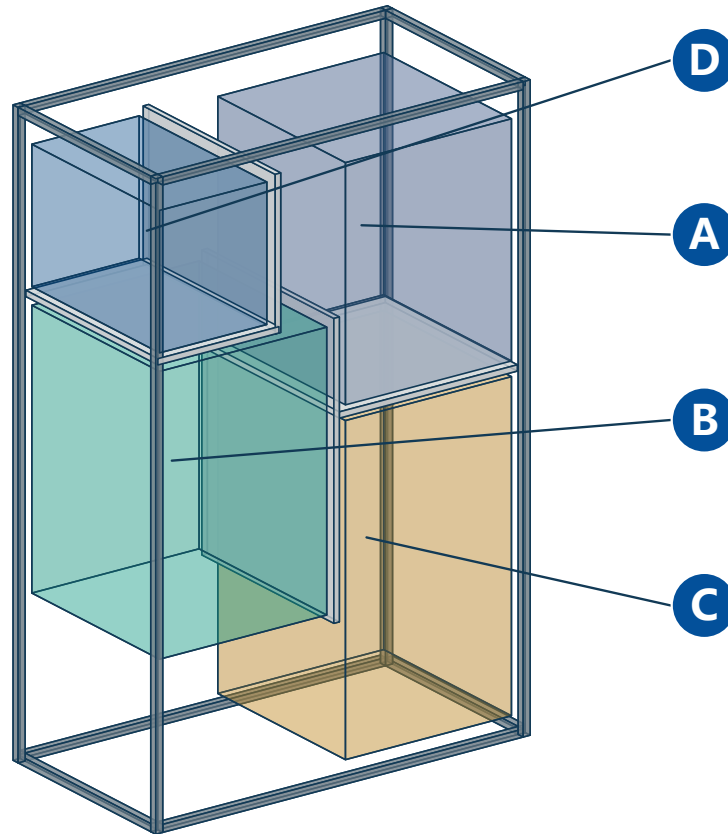


Figure 4-2. Functional compartment arrangement

A: busbar; B: circuit-breaker truck; C: cable; D: relay and instrument compartment.

A - Busbar compartment

Contains the main busbars, supports and branch connections. Establish the isolation boundary to the busbar system and adjacent panels before work.

B - Circuit-breaker compartment

Accommodates the withdrawable breaker, primary contacts, guides, location mechanisms, shutters and associated interlocks.

C - Cable compartment

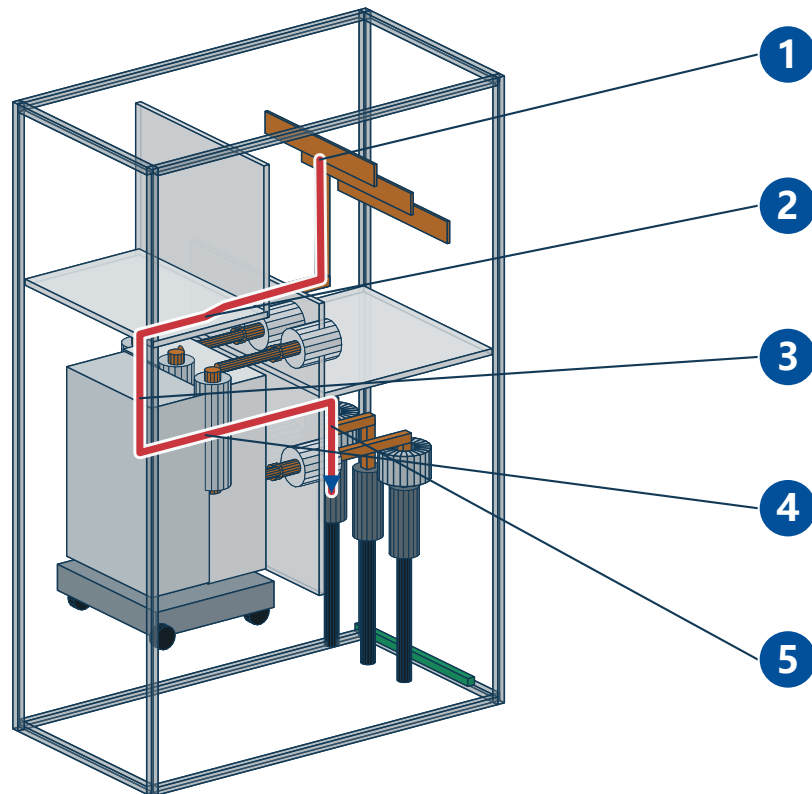
Contains the lower primary connections, CTs, cable terminations and fitted primary accessories. Cable-side backfeed is a separate source that must be isolated.

D - Relay and instrument compartment

Contains protection, control, measurement and secondary terminals. Identify auxiliary supplies, CT circuits and remote-control functions before secondary work.

04 | CONSTRUCTION AND FUNCTIONS

Primary circuit path

**Figure 4-3.** Representative single-phase connection

The highlighted path shows electrical function, not fabrication dimensions or a construction wiring drawing.

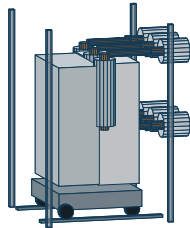
No.	Location	Function / check
1	Main busbar	Check phase identity and lineup connections.
2	Upper primary contacts	Connect the breaker to the busbar side.
3	Circuit-breaker	Makes, carries and interrupts assigned load and fault currents.
4	Lower primary contacts	Connect the breaker to the cable side.
5	CT / cable side	Check CT phase, polarity, terminations and the primary diagram.

Before inspecting a connection, include every possible supply and backfeed path in the work-zone safety measures.

04 | CONSTRUCTION AND FUNCTIONS

Circuit-breaker truck positions

SERVICE

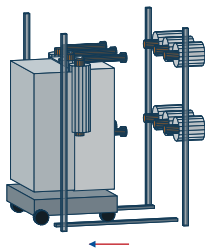


CONTACT DETAIL

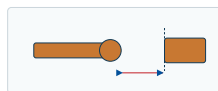


Primary moving and fixed contacts are engaged. Confirm positive location, locking and the actual position indication.

TEST / DISCONNECTED

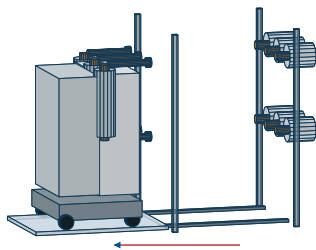


CONTACT DETAIL



Primary contacts are separated. Confirm secondary connection for the test task. This position is not proof that the whole panel is dead.

REMOVED



The truck is outside the enclosure. Use matched support, docking, locking and stopping equipment.

Figure 4-4. Truck positions and contact engagement - local schematic

Confirm mechanical location, locking and electrical feedback together. Do not use an intermediate position for normal operation. Figures do not define racking travel or handle turns.

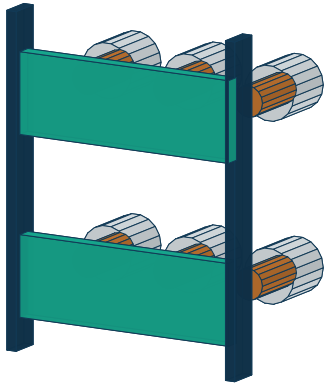
WARNING - Abnormal resistance

Stop if movement is obstructed or position feedback conflicts. Do not use extensions, impact or a bypassed interlock to continue.

04 | CONSTRUCTION AND FUNCTIONS

Shutters and earthing switch

SHUTTERS CLOSED



SHUTTERS OPEN

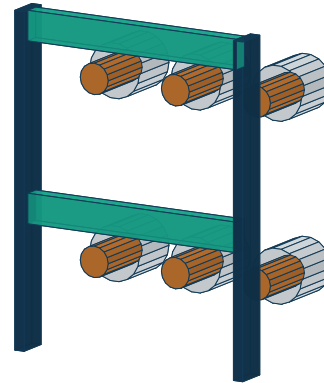
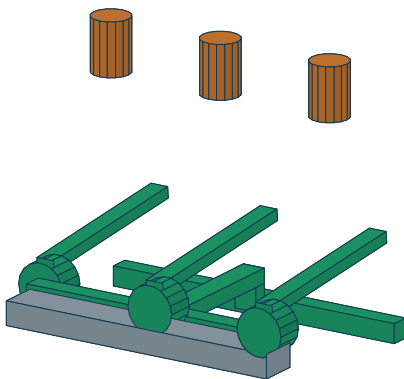


Figure 4-5. Shielding of fixed-contact interfaces

Closed shutters shield the contact zone; the contacts behind them can still be live. Never hold shutters open or enter the interface without effective isolation, proving dead, earthing and permission to work.

EARTHING SWITCH OPEN



EARTHING SWITCH CLOSED

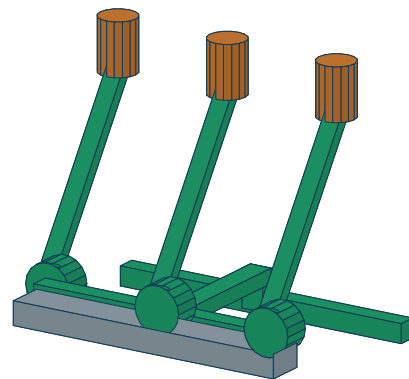


Figure 4-6. Earthing-switch contact relationship

Copper: cable-side fixed contacts. Green: earthing side. Mechanical principle only; actual operating direction follows the fitted mechanism.

DANGER - An earthed cable side is not an earthed panel

The busbar compartment, adjacent panels and circuits outside the work zone may remain live. Confirm every source and the actual extent of earthing before access.

04 | CONSTRUCTION AND FUNCTIONS

Busbars and cable-side equipment

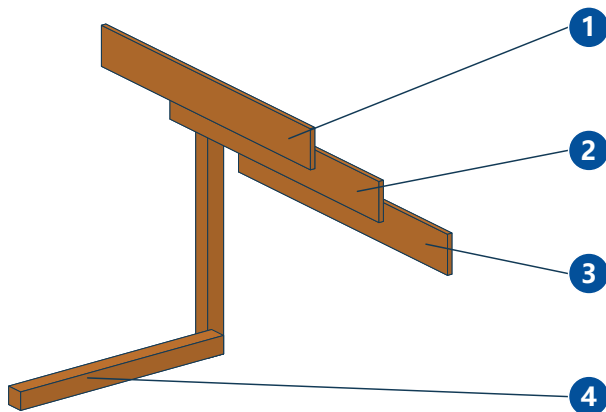


Figure 4-7. Main conductors and branch

1-3: conductor groups. 4: representative branch.

Busbar connections

Check the lineup sequence, phase identity, conductor schedule, joint hardware, contact surfaces and insulating supports before assembly.

Follow the joint drawing and specified tightening method. Do not pull, twist or bend conductors to hide an installation error. Do not apply generic bolt-torque values to an unverified joint.

After work

Restore insulation and phase identification. Remove debris and temporary items and retain the connection inspection record.

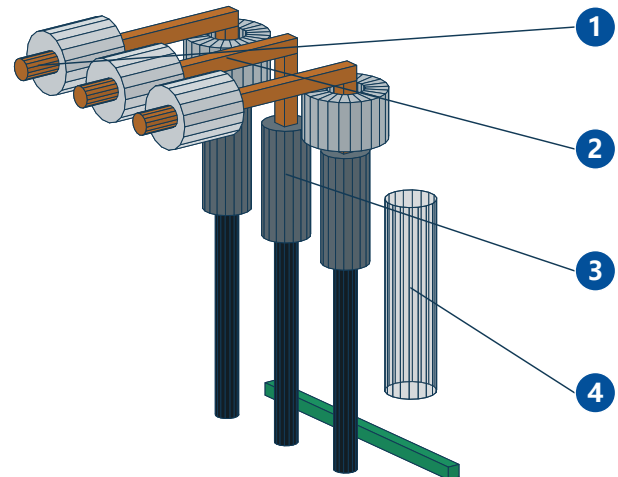


Figure 4-8. Cable-side arrangement

1: lower contacts. 2: CT. 3: cable termination. 4: surge arrester, where fitted.

Cable and CT identification

Check cable phase, termination type, support, screen and earth connections. Verify CT model, ratio, polarity and secondary use against the primary and secondary diagrams.

Cable weight and bending force shall not load the primary connection abnormally. Maintain the cable manufacturer's bending requirements and the project clearances.

WARNING - Backfeed

Opening the breaker or removing the truck does not prove that the cables are dead. Include all cable-side sources in the isolation procedure.

04 | CONSTRUCTION AND FUNCTIONS

Control, indications and protective earth

Object	Required identification / verification
Breaker	OPEN (O) / CLOSED (I); spring CHARGED / DISCHARGED. Compare mechanism state and feedback.
Truck	SERVICE / TEST or DISCONNECTED / REMOVED. Confirm positive location and locking.
Earthing switch	OPEN / CLOSED. Verify correspondence between mechanism, contacts and feedback.
Auxiliary supplies	AC 220 V is the breaker coil rating; check each other device separately.
Control and protection	Panel ID, feeder name, local/remote selection, relay functions, approved settings and terminal designations.
Protective earth	Continuous panel and inter-panel earths; required flexible door bonds and identified external earth connection.

Continuous protective earthing

Bond the frame and each required accessible metal part to the continuous protective-earthing system. Do not use a door as the series path for frame earthing or rely on incidental contact between metal surfaces.

After reassembly, verify inter-panel earths, door bonds and the required continuity measurements. Keep test points, method and results with the panel record.

Secondary-circuit work

Identify every control source, CT circuit and remote command before work. Protect against unintended operation and secondary-circuit hazards.

WARNING - Conflicting indications

If a mechanical position, local indicator and remote signal disagree, treat the state as unconfirmed. Stop the next operation and investigate safely.

TRANSPORT AND RECEIPT

Export packing and marking

Packaging system

Select the pack for the complete route, expected transfers and agreed storage interval. For sea freight or exposed multimodal transport, use a load-bearing skid, protected edges and openings, a sealed moisture-barrier enclosure with correctly sized desiccant, and a robust outer case. The packaging designer shall define the barrier grade, desiccant charge and preservation period for the actual route; no default preservation period is implied.

1. Secure each cubicle or shipping group to its skid at approved base locations; restrain withdrawable devices and pack loose accessories separately.
2. Cap cable entries, bus openings and exposed terminals. Protect instruments, painted surfaces and projections from abrasion and impact.
3. Identify every temporary transport brace and provide a controlled removal list for installation personnel.
4. Place dry desiccant inside the sealed barrier without direct contact with conductors, insulation or painted surfaces; add an indicator when specified.
5. Close the case only after the equipment and packing materials are clean and dry. Record sealing date, package number and preservation release.

WARNING - Preservation must remain intact

A punctured barrier, wet dunnage or damaged case invalidates the assumed protection. Stop release, inspect the equipment and restore the complete preservation system before shipment.

Wood packaging and transport marks

For international movement, raw solid-wood pallets, skids, battens, blocking and dunnage shall meet the phytosanitary requirements applicable at destination and in transit. Where ISPM 15 applies, use debarked, approved-treated wood carrying an authorised, legible mark. Packaging made wholly from processed material such as plywood or oriented strand board is outside ISPM 15, but any solid-wood base member, cleat or block within that package remains subject to the rule.

1. Mark the project or order, package identity, destination, package dimensions, gross mass and package count to match the packing list.
2. Show the verified centre of gravity and the approved lifting or fork-entry locations from the project lifting drawing; do not infer them from a generic illustration.
3. Apply only necessary handling symbols, including orientation, keep-dry, centre-of-gravity, lifting-location and no-stacking marks when each instruction applies.
4. Make marks durable, visible during handling and consistent on the case, packing list and lifting plan. Remove or obscure superseded marks before reuse.
5. Attach the packing list and document pouch where they remain accessible without breaching the moisture barrier.

Processed-wood exemption is material-specific, not package-wide. Confirm current import rules with the destination agent before packing.

TRANSPORT AND RECEIPT

Container loading and sea freight

Stow plan and CTU acceptance

Use a project-specific loading and securing plan for each cargo transport unit (CTU). Base it on actual package masses, footprints and centres of gravity, CTU payload and floor limits, the intended sea and land route, and rated securing points. Never assume a heavy package is immovable.

1. Verify CTU type, payload and floor capability. It shall be serviceable, clean, dry, uncontaminated and weather-tight.
2. Reject or refer wet flooring, sharp projections, defective doors or securing points, and damage that could puncture the barrier or contaminate the equipment.
3. Measure the finished packed envelope, including skid, crate and projections, against actual door, interior and transfer-route clearances; never rely on bare cubicle dimensions.
4. Keep upright. Never tilt to pass a door; if it cannot fit, select a carrier-approved open-top, flat-rack or oversize method with engineered restraint and weather protection.
5. Use load spreading. Keep the transverse centre of gravity near the CTU centreline and the overall centre of gravity low; obtain operator acceptance for concentrated loads or unusual balance.
6. Maintain access for final inspection and arrange cargo so that it cannot fall toward personnel when the doors open.

WARNING - Do not load an unsuitable CTU

Loading into a damaged, wet or underrated CTU can defeat both preservation and restraint. Correct the condition or obtain a suitable replacement before work continues.

Restraint, moisture control and release

1. Block, brace and lash each shipping unit against longitudinal and transverse sliding and tipping. Use rated CTU points and spread reaction forces across strong package or frame members.
2. Do not lash over doors, roof panels, pressure-relief parts, instruments or unsupported sheet metal. Do not overtighten restraints until the enclosure or skid deforms.
3. Fill harmful voids with engineered blocking or bracing. Do not rely on container doors to arrest moving cargo or permit an unsecured package to bear against them.
4. Use dry securing materials. Keep the sealed package barrier clear of sharp edges, verify desiccant or humidity indicators when fitted, and repair any breach before closing the CTU.
5. Photograph the final stow, restraints, marks, seal and package condition. Retain the loading plan and inspection record with the shipment file.

For sea carriage in a packed container, the shipper shall arrange and communicate the verified gross mass in accordance with the applicable SOLAS process. Package masses, CTU tare, dunnage and securing material must be included by the approved verification method.

Standard switchgear is not automatically dangerous goods. If batteries, pressurized items, oils, chemicals or powered tracking devices are included, a competent specialist shall determine classification, packing, marks and documents under current modal rules. Reassess the complete shipment and any lithium or sodium battery before air tender.

TRANSPORT AND RECEIPT

Handling and lifting

Lift authorisation and preparation

DANGER - Suspended load

A falling or unstable shipping unit can cause death or serious injury. Establish an exclusion zone, keep all persons clear of the suspended load, and allow only trained, authorised personnel to direct the lift.

Do not lift until the approved project lifting drawing and packing list identify the exact shipping unit, actual gross mass, overall dimensions, centre of gravity and permitted lifting or fork locations. A manual sketch or a mark on an unverified package is not authorisation to lift.

1. Confirm the route, landing area and overhead clearance. The landing surface shall be firm, level and able to support the concentrated load.
2. Inspect the skid, crate, transport fasteners and marked handling points. Stop if anything is loose, distorted, corroded or inconsistent with the lifting drawing.
3. Select crane, forklift, slings, shackles, spreader and other tackle for the documented load and configuration; verify current inspection status and rated capacity.
4. Confirm that doors are closed, withdrawable devices and accessories are restrained, and no loose item can shift during movement.
5. Hold a lift briefing, appoint one signaller, isolate the travel path and agree the stop signal before attaching equipment.

Use only the lifting arrangement shown for that shipping unit. Never assume that roof hardware, door apertures or structural members are lifting points.

Controlled movement

1. For crane handling, connect only to the documented lifting points. Use a spreader or other load-control arrangement when required by the project lifting plan.
2. Take up slack evenly, make a low trial lift, and confirm balance, rigging security and package integrity before travelling. Lower immediately if the unit tilts or the pack distorts.
3. Use tag lines only under the lift supervisor's control. Keep the load upright, move smoothly and avoid shock loading, sudden braking, collision or rotation into nearby structures.
4. Use a forklift only where marked fork entries and a load-bearing skid are provided. Fully engage and align the forks, centre the load, keep it as low as practicable and travel on a level, cleared route with a spotter.
5. Do not push doors or panels, drag the skid or improvise rollers. Do not stack shipping units unless the package is engineered and marked for stacking.
6. Land the unit gently on continuous supports at the approved position. Chock or secure it before releasing the lifting gear.

WARNING - Stop on abnormal movement

If the package shifts, leans, strikes an object, shows restraint failure or indicates shock or tilt, stop handling. Stabilise the area and obtain an engineering inspection before continuing.

Handling symbols communicate necessary instructions but do not replace the project lifting plan, equipment capacity check or site risk assessment.

TRANSPORT AND RECEIPT

Receipt and interim storage

Receipt inspection

1. Before unloading, compare the vehicle or container seal and package identities with the transport documents. Photograph the unopened load and visible damage.
2. Check package count against the packing list. Record missing packages, damaged cases, wetting and displaced blocking. Record activated shock or tilt indicators and humidity-indicator readings where fitted.
3. If the equipment is colder than the receiving environment, leave the moisture barrier closed until the equipment has acclimatised; opening it too early can cause condensation on internal parts.
4. Unpack in a clean, dry, protected area. Open the outer case and barrier carefully without damaging doors, wiring, insulation or painted surfaces, and retain packing evidence until inspection is complete.
5. Inspect for water ingress, corrosion, contamination, cracked insulation, loose parts, cabinet distortion and impaired door or truck alignment. Match loose accessories and documents to the packing list.
6. Record findings by package number and location. Preserve labels, indicators, seals and photographs, then notify the carrier and supplier in accordance with the contract procedure.

WARNING - Do not energise damaged or wet equipment

If moisture, impact damage, contamination or distortion is found or suspected, isolate the equipment. Do not install, test at high voltage or energise it until the supplier has reviewed the condition and authorised recovery actions.

Retain transport braces and preservation materials until receiving inspection and the shortage check are closed.

Storage before installation

Transport packaging alone shall not be assumed suitable for storage. Prepare a written plan for the site and duration. An intact seaworthy barrier may remain closed only within its marked preservation period while inspections confirm satisfactory case, seal and indicators.

1. Store switchgear upright and unstacked on a firm, level, dry support in a clean, secure, weather-protected and well-ventilated area.
2. Protect it from standing water, condensation, dust, cement and metal particles, corrosive vapours, salt spray, vibration, impact and ongoing construction work.
3. Keep bus and cable openings closed. If the unit is unpacked, use a clean breathable cover that permits air circulation; do not trap moisture beneath an unventilated temporary sheet.
4. Inspect packages and equipment at the intervals defined by the storage plan. Record barrier condition, desiccant or humidity indication when fitted, corrosion, contamination and physical damage.
5. If anti-condensation heaters are supplied, use them only through the connection and supply stated in the project schematic. Prevent any backfeed and keep the control arrangement identified.
6. For stored batteries or other separately packed accessories, follow their manufacturer's current storage instructions and expiry or maintenance requirements.

Before installation, confirm that the equipment is clean and dry, remove listed transport braces and desiccant, complete the prescribed inspections and tests, and close every temporary opening. Extend preservation only through an approved repacking plan.

INSTALLATION

Receiving, handling and installation

Receipt and storage

Check the order, packing list, panel numbers, withdrawable units, accessories and supplied documents. Record transport damage, moisture, deformation or missing items. Keep each truck identified with its corresponding panel. Quarantine equipment with unresolved safety defects.

Store panels upright, without stacking, in a dry, ventilated room at not less than -5 °C. Also observe component storage requirements. Inspect periodically for water ingress, condensation and corrosion. Assess and test equipment affected by flooding, impact or prolonged storage before release.

WARNING - Lifting and tip-over hazard

Verify the actual mass, centre of gravity, designated lifting points and handling plan. Never lift by door handles, busbars or non-load-bearing parts. Establish an exclusion zone and keep personnel clear of suspended loads.

Check route clearances and floor capacity. For crane handling of an unpacked enclosure, remove and handle withdrawable units separately when required by the approved lifting or installation drawing. Use suitable support and restraint. Keep the enclosure upright and prevent uncontrolled movement.

Site preparation

Verify the approved general arrangement, foundation, panel sequence, cable trenches and earthing layout. The room must be dry, secure and ventilated, with lighting and safe temporary supplies. Allow for door opening, truck withdrawal, transfer equipment, maintenance access and pressure-relief paths.

Positioning and assembly

1. Identify each panel and its orientation. Remove and protect the withdrawable unit as required by the installation procedure.
2. Position, align, join and anchor panels using the approved installation drawings. Check foundation and enclosure alignment rather than forcing busbars or twisting the frame.
3. Complete inter-panel protective earthing and the specified bonds to accessible metal parts.
4. Restore covers, partitions, cable-entry sealing and foreign-object protection. Keep ventilation and pressure-relief provisions unobstructed.
5. Check stability, doors, truck docking and protective continuity. Record defects and obtain inspection sign-off before proceeding.

Use the supplied foundation and installation drawings for fixing holes and interfaces. Do not scale installation dimensions from a perspective illustration.

INSTALLATION

Primary connections and protective earthing

Busbar assembly

1. Match busbars, links, supports and hardware to the panel sequence and connection drawing. Confirm phase identification.
2. Inspect insulation, plating and contact surfaces. Prepare connections using the specified process and prevent debris from entering the enclosure.
3. Assemble without unintended mechanical stress. Use the approved joint-specific tightening requirements and suitable calibrated tools.
4. Record the connection identity, tool and verification result. Restore insulation and protective covers.

Cable terminations

Verify cable and termination ratings, phase arrangement and circuit identity. Install to the cable and termination instructions, maintaining cleanliness, dryness, insulation and screen integrity. Provide the specified supports and stress control; cable weight and bending forces must not load the switchgear terminals.

Restore screen connections and earthing to the project drawings. Seal entries and remove tools, swarf and packaging. Inspect phase identification, support and clearances before closing the compartment.

Continuous protective earthing

Connect the truck-compartment earthing bar reliably to the main panel earthing bar. Complete inter-panel connections and the specified bonds to frames and opening metal parts. Hinges or incidental metal contact do not replace a specified bond.

Connect the main earthing bar to the switchroom earthing system using a green-and-yellow protective conductor of at least 16 mm². The actual conductor cross-section and connection arrangement must also satisfy the project fault current, duration and earthing design. Provide at least two connections to the switchroom earthing system for line-ups of ten or more panels.

Final verification

Check that connections are complete, identified and protected against strain. Verify protective continuity using the approved method and record the result. Restore any bonds disturbed during installation before energisation.

WARNING - Do not substitute joint requirements

Do not grind contact plating or apply a generic structural-bolt torque to busbars, insulators or electrical terminals.

INSTALLATION

Secondary wiring and control supplies

Identify every supply

The rated opening and closing coil supply is AC 220 V. Control, protection, spring charging, heating, lighting and other auxiliary circuits may have different supply requirements. Verify each circuit against its nameplate and the secondary drawings before connection.

WARNING - Do not connect all auxiliaries to one rating

The opening and closing coil rating does not define every auxiliary supply. Check voltage, AC or DC designation, polarity where applicable, protective devices and earthing separately.

Termination and routing

1. Use the current schematic, terminal plan, wire numbers and connector definitions. Verify circuit identity and polarity.
2. Provide suitable slack, support and protection. Keep wiring clear of doors, truck movement and mechanism travel.
3. Secure terminals and connectors using their specified requirements. Check for exposed conductors, loose connections or crushed insulation.
4. Update the controlled drawings after an approved change and retain the inspection and functional-test records.

DANGER - Current-transformer secondary circuits

Never open a CT secondary circuit while primary current is flowing. Use the approved test terminals and isolation procedure. Do not disconnect wires, insert unknown links or change the earthing point as a temporary workaround.

Protection and measurement

Check CT ratio, polarity, winding function, accuracy class and rated burden against the actual application. Confirm the approved protection settings and the correct assignment of each secondary circuit. After testing, verify restored continuity, polarity and earthing.

Controls and indications

Verify local and remote authority, opening and closing circuits, alarms, interlocks and position feedback. Mechanical position, panel indication and remote status must agree. A disagreement is an unconfirmed state: stop the next operation and investigate.

Control test supplies and remote commands to prevent unexpected operation. Restore temporary links, isolated functions and access permissions before commissioning handover.

COMMISSIONING

Pre-commissioning inspection

Inspection item	Acceptance check
Identity and documents	Panel, truck, model, serial numbers, drawings and operating scheme correspond.
Nameplates and labels	Ratings, circuit identity, safety signs and operating labels are complete and legible.
Enclosure and barriers	Anchors, doors, covers, partitions and shutters are complete, secure and correctly restored.
Truck and positioning	Correct unit; smooth movement; positive location and locking; indications agree.
Circuit-breaker mechanism	Charging, opening, closing and feedback function correctly without abnormal noise or repeated charging.
Earthing switch and interlocks	Positions agree with indications; mechanical and fitted electrical or key interlocks function correctly.
Protective earthing	Main, inter-panel and specified metal-part bonds are complete; continuity is verified.
Primary and secondary circuits	Phase identification, polarity, terminals, connectors and insulation are correct and undamaged.
Completion	Tools and temporary arrangements are accounted for; defects are closed; personnel and work limits are confirmed.

Inspection records

Inspect under approved isolated or controlled test conditions. Record the result, inspector and relevant document revision. Explain non-applicable items and retain original measurements where required. Link defect records to the panel identity.

WARNING - Do not commission defective equipment

Failed interlocks, contradictory indications, incomplete shutters, discontinuous earthing or damaged insulation require rectification and successful reinspection before release.

COMMISSIONING

Electrical tests and release for service

Approved test plan

Qualified, authorised personnel shall perform commissioning and maintenance tests to the applicable requirements, actual configuration and approved plan. Identify the test object, connections, isolation boundaries, instruments, acceptance criteria and restoration procedure.

WARNING - Rated insulation levels are not field settings

Do not apply the nameplate withstand voltage indiscriminately to the assembled panel. Identify and handle electronic equipment, instrument transformers, surge arresters and affected auxiliary circuits as required by the approved test plan.

Test scope

Include insulation, primary-circuit connections, protective continuity, circuit-breaker function, position feedback and secondary circuits as specified. Record resistance test points, test current, connection method and conditions so that later results can be compared with the baseline.

Verify protection settings, trip circuits, local and remote controls, alarms and CT circuits. Manage test supplies, stored energy, access restrictions and unexpected remote operation.

Restoration after testing

1. Discharge and earth tested circuits as required before handling test leads. Remove temporary connections and restore isolated equipment and circuits.
2. Restore protection, earthing, barriers and control authority. Have the responsible person verify the restoration.
3. Account for personnel, tools and temporary arrangements. Complete records, drawing changes and defect closure.

First energisation

Use the approved switching programme. Confirm equipment identity, work completion, management of temporary earthing, protection readiness and personnel clearance before switching. Outstanding safety defects prohibit release.

Observe and record

Observe indications, alarms, sound, load and fitted monitoring trends from the permitted location. Preserve records and follow the emergency procedure if an abnormal condition develops. Do not open an energised high-voltage compartment to complete installation or investigate a suspected fault.

OPERATION

Interlocks and operating permissions

No.	Interlock function	Operator check
1	Circuit-breaker operation is permitted only with the withdrawable unit at the service, test or withdrawn position.	Confirm the position is reached. Also verify control, stored-energy and protection conditions.
2	The truck cannot be moved with the circuit-breaker closed.	Confirm the breaker is open and all movement conditions are satisfied.
3	The truck cannot enter the service position with the earthing switch closed.	Check the earthing-switch state and the status of relevant safety measures.
4	Earthing-handle insertion is blocked when the truck is inward of the test-position boundary, towards service.	Verify the actual position and mechanism markings. Never force handle insertion or defeat the restriction.
5	The lower panel and rear cover cannot be opened with the earthing switch open.	Access still requires isolation, proving dead, earthing and a valid permit for the work area.

Functional verification

Under approved isolated test conditions, verify each equipment state, restricted action and reset. Check fitted key, electrical and sequence interlocks. Record results and investigate any disagreement before further operation.

WARNING - An interlock is not permission to work

Mechanical release does not establish an electrically safe work area. Never bypass contacts, cut interlock parts, remove guards or use extension handles to force an operation.

OPERATION

Circuit-breaker charging and switching

Before each operation

1. Confirm the task, panel and circuit identity, switching instruction, supervision and communication arrangements.
2. Check the primary-system condition and the actual breaker, truck and earthing-switch positions.
3. Confirm local or remote authority, secondary connections, control supply, protection and interlock conditions.
4. Check doors, barriers, tools and access. Do not proceed with mechanical damage, insulation concerns or unexplained alarms.

Spring charging

Use the charging controls and method specified for the fitted breaker. Confirm the charged indication. Stop if charging does not complete, the motor runs continuously or abnormal noise occurs.

WARNING - Stored mechanical energy

Disconnecting the control supply does not necessarily discharge the springs. Follow the controlled energy-release procedure before mechanism work. Never dismantle springs or drive parts simply because the electrical supply is isolated.

Switching and confirmation

When every operating condition is satisfied, open or close the breaker in accordance with the authorised switching instruction. Keep the required doors and barriers closed. Check mechanical indication, electrical feedback and system response after the command.

Do not use an intermediate truck position for operation. Functional checks in the test or withdrawn position require control of test supplies, remote commands and the movement area. Other parts of the panel may remain energised.

WARNING - Stop if status is unconfirmed

If the breaker fails to open or close, or indications disagree, do not repeat commands. Preserve the state and event record, report the condition and arrange safe isolation before investigation.

After an offline test

Remove temporary test supplies and wiring using the approved restoration procedure. Confirm control authority, breaker position, spring state and truck position. Record the final condition and confirm that it is suitable for the next authorised task.

OPERATION

Truck movement, withdrawal and insertion

Service and test positions

Before movement, confirm that the circuit-breaker is open. Check the target position, switching permission and all interlock conditions. Use the correct racking tool and follow the panel markings. Move smoothly without impact or added leverage.

At the final position, confirm positive location, locking and agreement between mechanical and electrical indications. Stop immediately if the truck binds, resistance increases abnormally or the indications conflict. Do not substitute counted turns for verification of the actual position.

Prepare the transfer equipment

Verify the truck mass and the required support, rail, height and docking interfaces. Secure and restrain the matching transfer device to the panel before accepting the truck. Keep the route clear and control unintended movement.

WARNING - Falling or runaway truck

Do not use an unmatched stand or have personnel catch or carry the truck as it leaves the compartment. Keep hands, clothing and tools clear of rails and pinch points.

Withdrawal and storage

Disconnect the secondary connector only in the permitted state and using the specified sequence. Protect pins, sockets and wiring. Maintain the docking lock and restraint throughout transfer; prevent dropping, skewing or uncontrolled rolling.

Secure the withdrawn truck and protect its primary contacts and insulation. Keep the panel shutters and compartment barriers effective. A closed shutter does not prove that the fixed contacts behind it are dead.

Before reinsertion

1. Match panel and truck identities and ratings. Check rails, contacts, locking, interlocks and secondary interfaces.
2. Inspect for damage, dirt or obstruction. Confirm the matching transfer equipment is correctly docked and restrained.
3. Insert and locate the unit using the specified procedure. Verify secondary connection, position indication and interlocks.
4. Do not prepare for energisation if the truck is not fully located, cannot lock or has inconsistent indications.

OPERATION

Earthing and return to service

Before operating the earthing switch

Include the operation in the approved switching and work procedure. Define the work area and identify every possible source, including cable-side backfeed and adjacent circuits. Complete the required isolation and proving-dead procedure; confirm the earthing point, position interlocks and permission.

An open breaker, the test position or an extinguished voltage indicator is not sufficient evidence for closing an earthing switch. If the position or interlock condition is uncertain, verify it before attempting operation.

Operation and access

Use the matching handle in accordance with the panel markings and earthing-switch instructions. Verify the completed mechanical position and electrical feedback. Reconfirm the permit and protective measures before opening the lower panel, rear cover or cable compartment.

DANGER - Adjacent circuits may remain live

Earthing the cable side does not make the complete panel dead. Busbars, adjacent panels and circuits outside the work area may remain energised. Maintain their isolation and barriers.

Preparation for restoration

1. Inspect the completed work. Account for personnel, tools, parts and temporary leads; remove loose objects.
2. Restore partitions, doors, connections and interlocks. Complete the required mechanical and electrical rechecks.
3. Manage temporary connections and earthing measures through the formal work-completion procedure. Verify protection, control and remote authority.
4. Obtain confirmation of defect closure and readiness from the responsible persons. Restore service using the approved switching instruction.

Observe the restored equipment

Check equipment status and system response. Record load, alarms and unusual sound. Stop subsequent operations if the equipment fails to respond, indications conflict or protection acts unexpectedly; follow the emergency procedure.

No single indicator establishes readiness for energisation. Do not return equipment to service with unresolved interlock, earthing or barrier defects. Removal of a safety measure requires the authority defined by the work and switching procedures.

MAINTENANCE

Inspection and maintenance planning

Planned and condition-based work

Arrange a planned outage inspection annually under normal service conditions. Set routine inspection intervals through the operating organisation. Consider load, environment, operating frequency, service time, fault interruptions and ageing. Retain baseline measurements and previous inspection records.

Shorten intervals for moisture, dust, corrosion, frequent operation or significant changes in condition. Apply stricter component requirements where specified. Record the reason, approval and next inspection date when adjusting the plan. Do not wait for the annual outage to investigate an abnormal condition.

Routine observation

From the permitted access area, check appearance, locks, identification, external indications, alarms, abnormal sound or smell, and room condition. Record load and fitted monitoring trends under comparable conditions.

WARNING - Keep high-voltage barriers closed

Do not open compartments, remove guards or insert probes for routine observation or temperature measurement. Do not create an observation opening without an approved design.

Triggers for additional inspection

1. Fault interruption or unexpected protection operation: preserve event and disturbance records and assess the primary circuit, breaker and mechanism.
2. Changed operating time, abnormal resistance or conflicting indications: assess the truck, shutters, interlocks and feedback.
3. Condensation, contamination or corrosion: inspect insulation and the source of the environmental problem.
4. Flooding, impact, displacement, relocation or major component replacement: arrange specialist assessment and required tests.
5. Changed load or operating arrangement: review thermal conditions and monitoring trends; arrange an outage when indicated.

Responsibility and emergency response

Use trained, authorised personnel for maintenance. Specialist diagnosis, adjustment, major replacement and testing require the appropriate competence and approval.

For smoke, discharge, burning smell, deformation or water affecting insulation, keep clear, stop local operation and follow the emergency procedure. Do not open a door to locate the fault. Record the event without putting personnel at risk.

MAINTENANCE

Cleaning, lubrication and maintenance checks

DANGER - Establish the safe work area first

Isolate primary and auxiliary sources, prevent backfeed and re-energisation, prove dead and apply earthing. Obtain the work permit and control stored energy before touching internal parts. Functional checks needing a supply require a separately controlled plan.

Cleaning and condensation

Record contamination and discharge evidence before cleaning. Use suitable dry vacuum equipment, soft non-shedding brushes and clean lint-free cloths. For persistent deposits, use only materials approved for the insulation and surface coating. Remove residues and confirm complete drying before inspection and any required tests.

Do not wash the interior or spray cleaner into the panel. Do not use compressed air to drive dust into contacts, mechanisms or secondary devices. Identify the moisture source and check fitted heaters, controls, seals, cable entries and room ventilation; wiping away condensation alone does not correct its cause.

Corrosion

Record affected areas. Use compatible approved repair materials without coating electrical contact or earthing surfaces. Corrosion affecting structural strength or reliable operation requires technical assessment.

Contacts, movement and connections

Inspect primary contacts for overheating, erosion, damage and silver-plating condition. Replace contact parts with damaged plating, exposed copper, severe corrosion or overheating discolouration; do not grind them for continued service.

Check truck guidance, locking, shutter coverage and return, earthing bonds, switch indication and secondary connectors. Remove obstructions without modifying travel or interlock parts.

Controlled lubrication and tightening

Lubricate only the points and materials specified for the fitted component. Do not spray the complete mechanism, mix unknown lubricants or grease insulation. Use the approved connection-specific torque with an appropriate calibrated tool; record the joint, setting, tool and verification.

Do not use repeated tightening to conceal overheating, damaged threads or distorted contact surfaces. Investigate the defect and follow the approved repair procedure.

Completion

Restore parts, wiring, barriers and interlocks. Account for tools and personnel. Complete targeted tests, defect closure and approval for return to service, retaining the final condition and maintenance records.

MAINTENANCE

Abnormal conditions and replacement parts

Condition	Initial safe response
Will not close	Stop repeated commands. Preserve status and check controls and mechanism under an approved safe plan.
Will not open; state uncertain	Arrange safe isolation through the emergency procedure. Do not dismantle the mechanism at the faulted panel.
Charging abnormal	Stop further operation. Isolate relevant energy sources before investigation.
Truck binds; shutter incomplete	Stop force or movement. Arrange isolated inspection; do not extend the handle or expose fixed contacts.
Earthing or indication abnormal	Treat the state as unconfirmed. Verify position under safe conditions; do not defeat interlocks.
Heat, discharge, burning smell	Keep clear and arrange safe response. Do not open doors to trace the fault.
Protection trips repeatedly	Preserve event records and identify the cause. Do not repeatedly energise or increase settings to suppress tripping.

Ordering and service information

Provide the project, panel identity, complete model and serial number; component nameplate and part number; drawing revision, interface and wiring details; and the fault history. Contact HJATIS POWER using the service details supplied with the equipment.

Preserve failed parts needed for analysis. Store spares identified and protected against moisture and corrosion.

Verify every replacement

Equal ratings or similar appearance do not establish interchangeability. Confirm mechanical interfaces, electrical duties, protection and interlocks. Complete the required technical review, inspection and tests after replacement.

Record old and new component identities. Update drawings, settings, labels and controlled copies after approved changes. Do not reinstall unidentified, cracked, carbonised or severely damaged parts.

10 | IDENTIFICATION AND SAFETY SIGNS

Product nameplate and identification

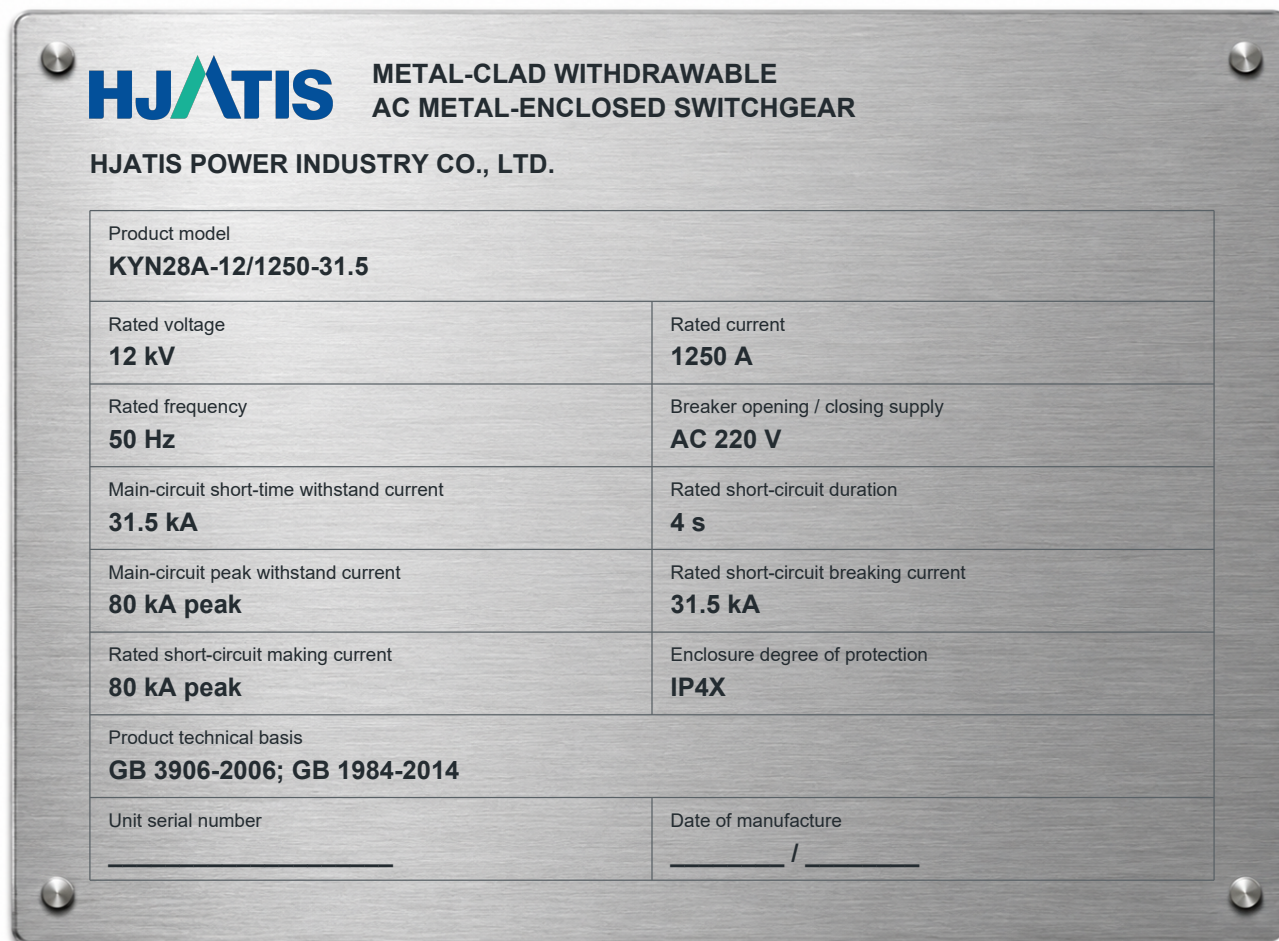


Figure 10-1. Metal nameplate - simulated finish.

Equipment identity

Use the complete GB model, unit serial number and panel designation when ordering parts, requesting service or recording tests. Keep the cabinet and circuit-breaker identity records together.

Check that the installed nameplate is legible and securely fixed. Record the manufacture date and serial number from the delivered unit in the equipment register.

Reading the ratings

Short-time and peak withstand values on this plate refer to the main circuit. Use the component data for the earthing switch and the specified verification parameters for the earthing connection.

The opening / closing supply is the breaker coil supply. Check motors, heaters, protection relays and other auxiliaries individually against the secondary diagrams and component labels.

10 | IDENTIFICATION AND SAFETY SIGNS

Cabinet markings and position indications

Keep permanent identification, mechanical position indications and temporary work signs legible and distinct. The circuit designation must agree with the single-line diagram and the approved switching schedule.

Marking / indication	Location and information	Operator check
Cabinet identity	Top identification strip: authentic HJATIS logo and product series; panel and circuit designation.	Match the panel to the authorised task before touching a control.
Product nameplate	Cabinet identification and declared ratings, serial number and manufacture date.	Use the complete GB model and the actual unit identification.
Breaker position	Mechanical OPEN / O and CLOSED / I indication at the breaker operating mechanism.	Read the mechanical indication; cross-check remote status where fitted.
Stored-energy indication	CHARGED / DISCHARGED indication at the spring mechanism.	Identify stored energy separately from breaker position.
Truck position	SERVICE and TEST / ISOLATED position indications; withdrawn position and locating / locking points.	Confirm the truck is fully located. An intermediate position is not an operating position.
Earthing-switch position	OPEN and CLOSED indication, operating direction and handle access identification.	Verify the mechanical position. Do not infer it from breaker or truck status.
Primary and secondary circuits	Phase identification; terminal, cable and wire references; voltage-detection interface identification.	Match the approved connection drawings. Do not identify a circuit by colour alone.
Protective earthing	Protective earthing symbol at the designated earth connections and identification of the earth bar.	Keep markings visible; preserve protective continuity across removable parts.

Indications are not isolation

An unlit lamp, remote OPEN signal or closed shutter does not prove the primary circuit dead. Follow the isolation, voltage-proving and earthing procedure before access.

Replacement labels

Replace damaged, loose or unreadable labels with the correct equipment-specific text and symbols. Do not cover the nameplate, warning signs, ventilation openings or inspection windows.

10 | IDENTIFICATION AND SAFETY SIGNS

Safety labels and work signs

Use standardised safety signs with a clear supplementary instruction where required. Permanent warnings identify hazards; temporary prohibitions and mandatory work signs support the controlled work procedure.

**WARNING****Electric shock hazard**

Place at access points to hazardous electrical parts. Access is restricted to authorised personnel following isolation and verification.

**WARNING****Arc hazard**

Identify locations where arc hazards must be considered. Keep doors and covers secured during operation and follow the task-specific protection requirements.

**PROHIBITION****Do not switch on**

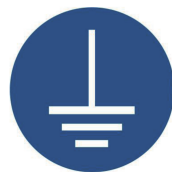
Apply at the relevant control / isolation point when equipment must remain out of operation. Identify the work party and work authorisation.

**PROHIBITION****Do not change switch state**

Use when the established switching state must be preserved. Removal and operation require the authorised release process.

**MANDATORY****Lock the isolation point**

Apply the assigned lock and identification under the site isolation procedure. A lock controls access; it does not prove absence of voltage.

**MANDATORY****Apply protective earthing**

Apply the required earthing measures after isolation and proving dead. This instruction sign is not an earthing-switch position indicator.

Placement and condition

Keep signs visible in the normal approach and operating position. Inspect at commissioning and after maintenance; replace missing, faded or damaged signs promptly.

Control of temporary signs

Only the authorised release process may remove work signs or locks. Signs do not replace secure isolation, proving dead, earthing or a valid work permit.

11 | TOOLS AND SAFETY EQUIPMENT

Mechanical maintenance tools

T01 Calibrated torque wrench



Figure 11-1. Torque wrench body; match the head and sockets to the task.

STAHLWILLE MANOSKOP 730N/20. Tool category example.

Selection and application

Use for connections with a specified tightening torque. Select a suitable range, head and socket, and verify calibration status. Account for adapters and effective head length as instructed by the tool manufacturer.

Use limitations

Set torque from the approved assembly or component instructions. The illustrated tool range is not a switchgear tightening specification. Do not use it as a breaker bar or to force a truck or interlock.

T02 Hand-tool set



Figure 11-2. Hand-tool set.

YATO YT-3875VP. Tool category example.

Application

For authorised mechanical work and secondary connection servicing. Match sockets, spanners and driver tips to the fasteners.

Selection and checks

Check heads, handles and insulating coverings for damage. Record tools issued and account for every item before closing the cabinet.

Use limitations

Coloured handles are not proof of a voltage rating. Low-voltage insulated tools are not tools for contact with the live primary circuit.

Equivalent qualified tools may be used when their interfaces, capability and safety ratings meet the task.

11 | TOOLS AND SAFETY EQUIPMENT

Electrical inspection and measurement tools

T03 Digital multimeter



Figure 11-3. Digital multimeter.

Fluke 87V MAX. Auxiliary low-voltage circuits only.

Application

Measure identified auxiliary or secondary circuits within the instrument rating. Establish the circuit function and expected voltage first.

Selection and checks

Check measurement category, voltage rating, leads and fuses. Inspect the instrument and select the correct terminals, function and range.

Use limitations

Do not connect to the primary high-voltage circuit or use as a high-voltage detector. De-energise and discharge the circuit before resistance or continuity measurements.

T04 Thermal imaging camera



Figure 11-4. Thermal imaging camera.

Fluke TiS55+. Safe access and observation points are defined by the site plan.

Application

Trend temperatures at safely observable points. Record load, ambient conditions and measurement settings when comparing results.

Selection and checks

Select a suitable temperature range, field of view and spatial resolution. Set emissivity and other parameters as required by the instrument instructions.

Use limitations

Do not open live high-voltage compartments, defeat interlocks or insert a probe for inspection. Ordinary glass is not automatically an infrared inspection window.

11 | TOOLS AND SAFETY EQUIPMENT

Insulation and contact-resistance test tools

T05 Insulation resistance tester



Figure 11-5. Insulation resistance tester.

UNI-T UT513A. Tool category example.

Application

Check insulation under an approved, de-energised test plan. Select test points and isolate sensitive devices before applying the test output.

Selection and checks

Verify instrument and lead ratings, condition and calibration status. The required test voltage is specified by the test plan, not by the instrument maximum.

Use limitations

Establish the test boundary and discharge tested circuits afterwards. This instrument is not a primary voltage detector or a substitute for a prescribed withstand test.

T06 Low-resistance ohmmeter



Figure 11-6. Low-resistance ohmmeter.

Megger DLRO100 series. Tool category example.

Application

Measure an isolated conducting path using the approved four-wire connection method and test current. Record test points, temperature and results.

Selection and checks

Match output capability, measuring range, leads and calibration to the method. Secure current and potential connections at the designated points.

Use limitations

Do not compare unlike test paths or use an ordinary multimeter resistance range as an equivalent test. Do not interrupt protective earthing without the approved work plan.

11 | TOOLS AND SAFETY EQUIPMENT

Cleaning and lockout tools

T07 Industrial vacuum cleaner



Figure 11-7. Industrial vacuum cleaner.

Karcher NT 30/1 Tact Te L. Tool category example.

Application

Remove loose dust during isolated, earthed maintenance. Use suitable accessories and collect debris without damaging insulation or mechanisms.

Selection and checks

Select filtration, hose and accessories for the actual contamination. Inspect the machine and keep the work area controlled.

Use limitations

A vacuum cleaner is not an insulated live-working tool. Wet-and-dry capability does not permit washing the cabinet. Do not assume suitability for explosive, conductive or hazardous dust.

T08 Personal safety lock



Figure 11-8. Personal safety lock.

CATU AL-230-EX. Lockout identification and tags are selected separately.

Application

Secure an approved isolation point under the site lockout procedure. Identify the lock owner, circuit and work authorisation.

Selection and checks

Match shackle and lock body to the isolation device. Verify key control, condition and identification; apply the site procedure for group work.

Use limitations

The metal shackle is not insulating equipment. A lock is neither proof of isolation nor proof that the circuit is dead. Remove only through the authorised release procedure.

11 | TOOLS AND SAFETY EQUIPMENT

Matched accessories and safety equipment

Provide the cabinet-specific operating accessories and task-specific safety equipment before commissioning. Confirm the delivered interfaces; do not substitute a similar-looking handle, truck or transfer device.

Equipment	Selection and verification
Truck operating handle	Match the fitted racking mechanism and the supplied operating interface. Do not add leverage or use power tools.
Earthing-switch handle	Use the matched operating handle and the indicated direction. Keep handle access and interlock features intact.
Transfer / service device	Match rail, locking and height interfaces to the supplied truck arrangement. Verify stability and restraint before transferring the breaker.
Keys and access controls	Identify the associated locks and retain the authorised key schedule. Control spare and interlock keys.
High-voltage detector	Select an approved device for the system voltage and intended test interface. Verify serviceability before and after proving dead.
Portable earthing equipment	Match fault-current duty, connection points and operating method to the approved earthing plan. Inspect conductors, clamps and identification.
Personal protective equipment	Select shock, arc, mechanical and other protection from the task risk assessment and site rules. Inspect condition and validity before use.
Barriers, signs and lighting	Provide the required work boundary, temporary signs and suitable illumination without obstructing escape routes or ventilation.

Control and storage

Store accessories dry, clean and identified to the equipment. Keep an issue / return register. Quarantine damaged, unidentifiable or overdue equipment.

Checks before use

Confirm inspection and calibration status where applicable. Follow the instrument or safety-equipment instructions and the site inspection schedule; there is no common interval for every tool.

APPENDIX A | CONTROLLED HANDOVER RECORD

Receipt and transport inspection record

Equipment and site	Record identification
Site / location: _____	Record no.: _____
Panel / circuit ID: _____ Unit serial no.: _____	Date / time: _____ Work / delivery ref.: _____

Mark each item Pass / Hold / N/A. Describe damage, shortages and actions in the remarks or an attached controlled record. Do not release an unresolved item by leaving the result blank.

Inspection item	Result	Remarks / action reference
Package ID, shipping marks and delivery quantity		
Visible packing damage, moisture and impact evidence		
Enclosure, doors, finish, windows and fittings		
Main nameplate and breaker identity		
Truck restraint and supplied transfer accessories		
Operating handles, keys and loose accessories		
Drawings, packing list and delivery documents		
Storage environment and temporary protection		

Receipt details	Recorded information
Carrier / consignment / package IDs	
Damage or shortage record / attached image IDs	
Storage location / person responsible	

Performed / recorded by

Delivery accepted / held: _____

Name / signature / date: _____

Checked / authorised by

Outstanding items / release ref.: _____

Name / signature / date: _____

Retain with the equipment file. A signed receipt does not replace installation or commissioning acceptance.

APPENDIX B | AUTHORISED COMMISSIONING RECORD

Commissioning and interlock record

Equipment and site	Record identification
Site / location: _____	Record no.: _____
Panel / circuit ID: _____ Unit serial no.: _____	Date / time: _____ Work / delivery ref.: _____

Carry out checks under the approved commissioning plan with the primary circuit isolated and earthed as required. Record Pass / Hold / N/A and the associated measurement or procedure reference.

Check / verification	Result	Record / corrective action
Foundation, alignment, fastening and clearances		
Primary connections and protective earthing		
Secondary wiring, supplies and CT circuits		
Insulation, continuity and contact-resistance tests		
Protection settings, tripping and remote signals		
Breaker closes only at permitted truck positions		
Closed breaker blocks truck movement		
Closed earthing switch blocks entry to SERVICE		
Truck position restricts earthing-switch operation		
Cable-access interlock and shutters function correctly		
Tools removed; covers, labels and barriers restored		

Test / switching plan reference	Defect closure / restrictions reference

Performed / recorded by

Commissioning completed: _____

Name / signature / date: _____

Checked / authorised by

Energisation release ref.: _____

Name / signature / date: _____

An interlock must not be defeated to obtain a Pass. Record the actual tested states and stop if expected blocking is absent.

APPENDIX C | CONTROLLED WORK RECORD

Maintenance and return-to-service record

Equipment and site	Record identification
Site / location: _____	Record no.: _____
Panel / circuit ID: _____ Unit serial no.: _____	Date / time: _____ Work / delivery ref.: _____

Work control and equipment	Reason for work and instruments
Permit / isolation plan: _____	Work reason / event: _____
Breaker ID / counter: _____	Instruments / calibration ref.: _____

Inspection / work	Finding, measurement and action
Enclosure, cleanliness, insulation and ventilation	
Primary joints, contacts and protective earthing	
Breaker, truck, shutters and earthing mechanism	
Secondary wiring, protection and auxiliary devices	
Parts replaced / approved part and batch reference	
Post-work tests and interlock verification	

Final checks	Record
Tools / temporary leads / debris accounted for	
Covers restored / defects closed / restrictions	
Next review or maintenance trigger	

Performed / recorded by

Work completed by: _____

Name / signature / date: _____

Checked / authorised by

Return-to-service release ref.: _____

Name / signature / date: _____

Attach measured values, test conditions and component work sheets. Record removal of temporary earths and locks under the authorised switching procedure.

APPENDIX D | EQUIPMENT FILE AND QUICK REFERENCE

Documents, records and service support

Retain in the equipment file	Purpose / control
This manual and the equipment register	Keep the current revision, complete GB model, serial number and panel designation together.
General arrangement and foundation drawings	Control the supplied dimensions, access, fixing and site interfaces.
Single-line and primary connection drawings	Identify circuit function, phase arrangement and primary connection details.
Secondary diagrams and terminal schedules	Control wiring, auxiliary supplies, CT circuits, interlocks and interfaces.
Component instructions and approved parts list	Retain breaker, protection, metering and auxiliary-device instructions for the fitted configuration.
Commissioning and protection records	Retain acceptance results, settings, trip checks and authorised energisation release.
Maintenance, event and modification records	Record findings, measured values, replaced parts and approved changes through the equipment life.

Information for service requests

1. Quote the complete GB model, unit serial number, panel designation and breaker identification.
2. Describe the event, time, operating state, indications and any protection / alarm records.
3. Provide the applicable drawing revision and relevant inspection or test results. Include clear, safely obtained photographs where useful.

Keep the equipment isolated where a defect affects safe operation. Do not repeatedly reclose or reset after a fault without investigating the cause.

Replacement and modifications

Order parts against the fitted configuration and approved parts list. A matching series name or rating alone does not establish mechanical, insulation, interlock or wiring compatibility.

Refer changes affecting safety, ratings, protection or interfaces to the manufacturer before implementation. Update drawings and records after authorised changes.

Manufacturer and brand

HJATIS POWER INDUSTRY CO., LTD.
HJATIS POWER

Use the service contact stated in the project delivery documents. Retain this manual with the installation.