

MNS • GGD • GGJ

Low Voltage Switchgear and Capacitor Bank

400 V • up to 6300 A / 100 kA • IEC 61439-2



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Overview

This manual covers the three low voltage assemblies HARRL builds for distribution boards downstream of a distribution transformer: the **MNS** withdrawable assembly, the **GGD** fixed assembly and the **GGJ** automatic power factor correction cabinet. All three share the same 2200 mm cabinet height, the same busbar system philosophy and the same design criteria, so they line up in one switchroom and are quoted, shipped and installed as one package.

Ratings run from 1600 A to 6300 A on the main busbar, with short-time withstand current from 30 kA to 100 kA. Every assembly is engineered to GB/T 7251.12-2023 (equivalent to IEC 61439-2) and routine tested in our works before shipment.

The Three Assemblies

Each has its own section in this manual

MNS — withdrawable	Drawer units, high circuit density, motor control
GGD — fixed	Fixed devices, incoming / feeder / tie duty
GGJ — capacitor bank	8 × 30 kvar steps, 7 % detuned

Reference Standards

Design and routine testing basis

- **GB/T 7251.1 / GB/T 7251.12-2023** — Low voltage switchgear and controlgear assemblies (equivalent to IEC 61439-1 / IEC 61439-2)
- **GB/T 15576-2020** — Low voltage complete reactive power compensation devices (GGJ)
- **IEC 60947-1 / IEC 60947-2** — Switchgear and controlgear, circuit-breakers
- **IEC 60529** — Degrees of protection provided by enclosures (IP code)
- **GB/T 2681 / IEC 60445** — Colour code of conductors in the assembly

Normal Service Conditions

Ambient air temperature	-5 °C to +40 °C, 24 h mean ≤ 35 °C
Altitude	≤ 2000 m
Relative humidity	≤ 50 % at +40 °C; higher at lower temperature
Pollution degree	3
Installation	Indoor, floor standing, front access
Seismic / special sites	On request

* Sites outside these limits — high altitude, tropical humidity, corrosive or coastal atmosphere — are handled as a derated or specially treated design. State the site data with the enquiry.

Type Designation

MNS	Withdrawable (drawer) type LV assembly
GGD	Fixed type LV distribution assembly
GGJ	LV automatic power factor correction cabinet
Rating suffix	Main busbar rated current, e.g. MNS-3150A

MNS — Withdrawable Assembly

High circuit density, live-part replacement of outgoing units

- Modular frame assembled from C-profiles on a 25 mm module grid — bolted throughout, no welded joints, so the same parts serve every cabinet width
- Withdrawable drawer units in 8E/2 and 8E sizes; up to ten outgoing circuits in one 600 mm wide cabinet
- Each drawer is mechanically interlocked with its own switching device: the drawer cannot be inserted or withdrawn while the device is closed
- Separate functional compartments for drawers, busbars and cables, so work on one outgoing circuit does not expose the busbar system
- Main busbar mounted at the rear top, distribution busbar vertical in the drawer column — short, symmetrical current paths
- Sheet steel enclosure, powder coated RAL 7035, IP41 as standard

Drawer Unit Sizes

8E/2 drawer	Half-height unit, up to 63 A outgoing
8E drawer	Full-height unit, up to 250 A outgoing
Circuits per cabinet	Up to 10 in one 600 mm wide column

MNS — Rated Parameters

Withdrawable type low voltage assembly

Parameter	Unit	MNS-1600A	MNS-3150A	MNS-6300A
Rated operational voltage Ue	V	400	400	400
Rated insulation voltage Ui	V	690	690	690
Rated impulse withstand voltage Uimp	kV	6	6	6
Rated frequency	Hz	50	50	50
Main busbar rated current	A	1600	3150	6300
Distribution busbar rated current	A	800	1000	1250
Main busbar short-time withstand current Icw	kA	30	65	100
Main busbar peak withstand current Ipk	kA	63	143	220
Distribution busbar Icw	kA	30	30	30
Distribution busbar Ipk	kA	63	63	63
Clearance	mm	≥ 10	≥ 14	≥ 10
Creepage distance	mm	≥ 12.5	≥ 16	≥ 12.5
Degree of protection	—	IP41	IP41	IP41
Unit dimensions W × D × H	mm	600 × 1000 × 2200	600 × 800 × 2200	600 × 1100 × 2200
Installation	—	Indoor	Indoor	Indoor

* Design and routine test basis GB/T 7251.12-2023 (IEC 61439-2). Incoming and bus-tie cabinets are built 800 – 1000 mm wide; the width above is the standard outgoing unit. Duration of the short-time withstand current is stated in the project documentation.

Internal Separation

Form 2b	Busbars separated from functional units
Form 3b	Plus separation between functional units, terminals separated from busbars
Form 4b	Plus terminals of each unit separated from each other, in their own compartment

* State the required form with the enquiry; it drives cabinet width and price.

Where it earns its place

Motor control centres, process plants and any board where outgoing circuits are numerous and downtime is expensive — a faulty drawer is swapped for a spare while the rest of the board stays energised.

MNS Withdrawable Cabinet — Front and Side Views

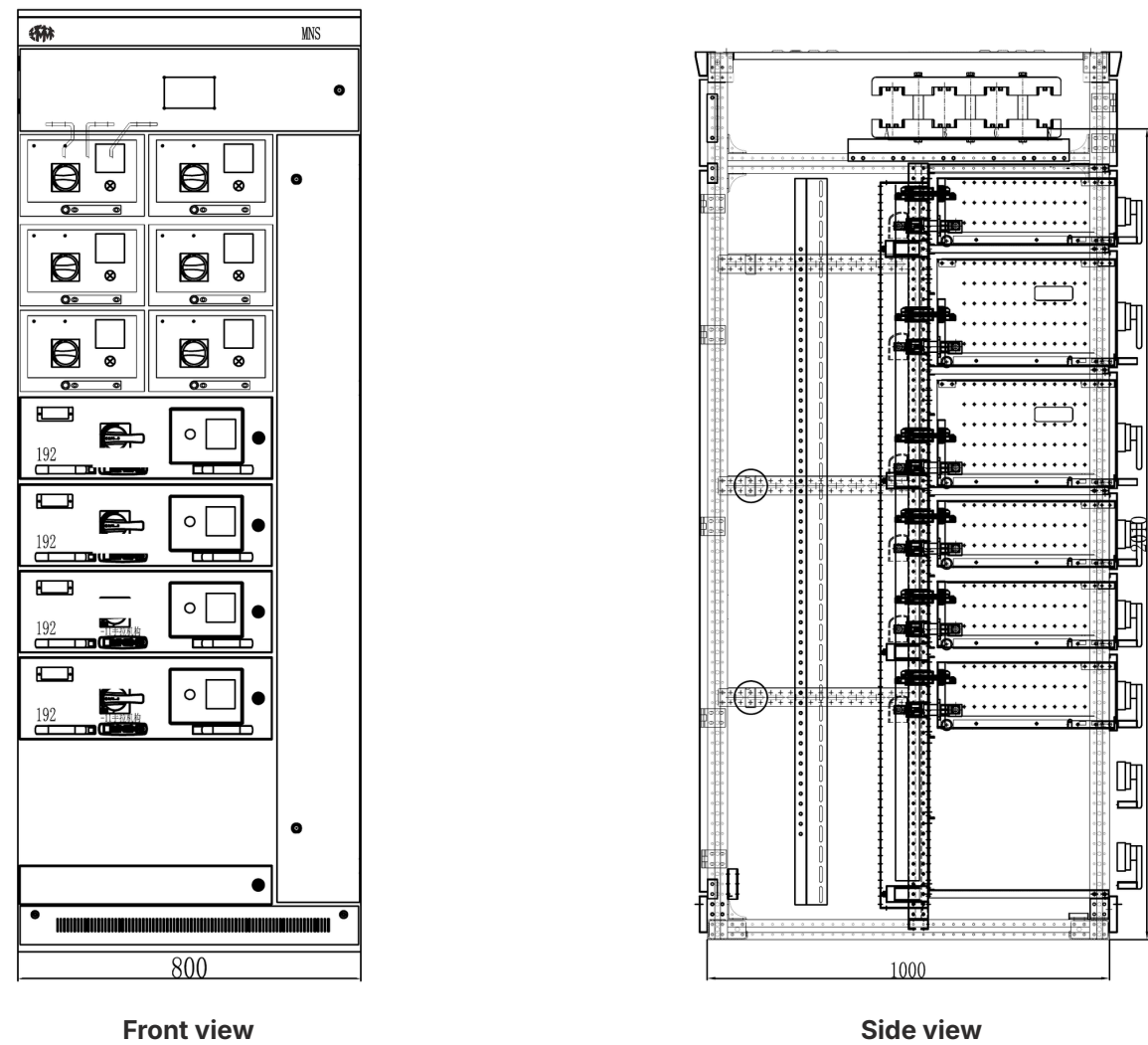


Fig. 1 — Drawer front faces, drawer column, distribution busbar and cable zone

Compartments

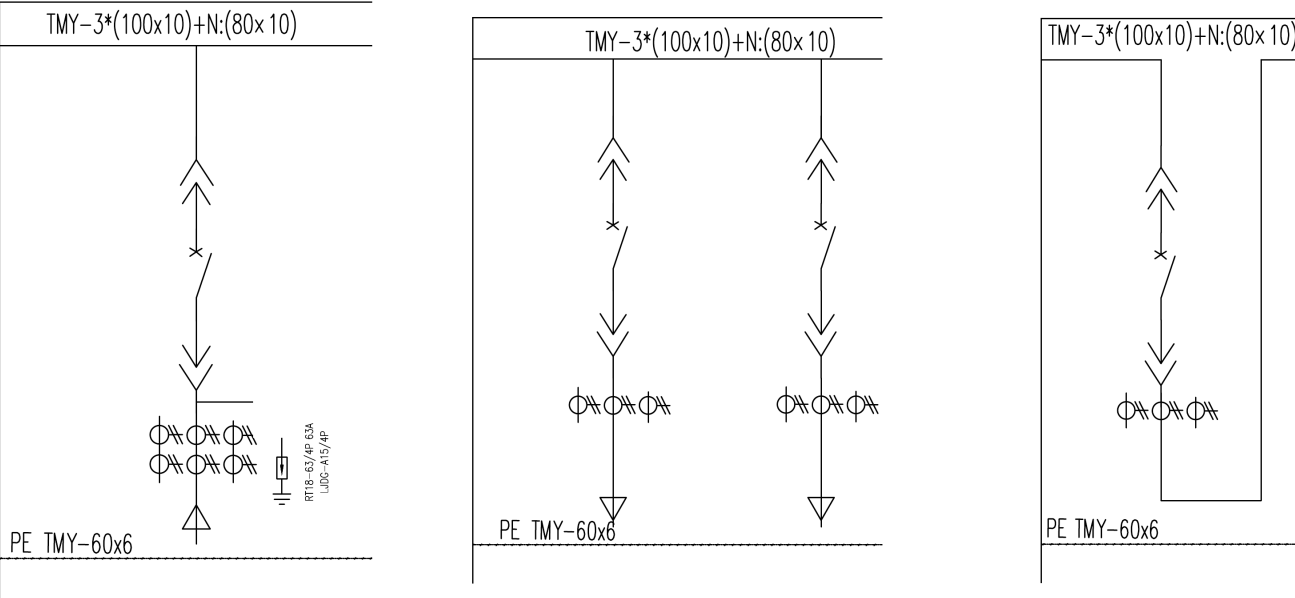
- **Drawer compartment** — front, holds the withdrawable units; each unit has its own sheet steel enclosure and door
- **Busbar compartment** — rear top, main busbar on insulated supports, closed off from the drawer and cable zones
- **Cable compartment** — rear, outgoing terminals and cable glands, reachable from the back without opening the drawer column
- **Distribution busbar** — vertical in the drawer column, feeds every drawer through self-aligning contacts

Busbar Cross-Sections

MNS main busbar	TMY-3 × (100 × 10) + N (80 × 10) mm
MNS PE busbar	TMY-60 × 6 mm
Distribution busbar	Vertical in the drawer column, 800 - 1250 A

MNS Typical Scheme Units

Main busbar TMY-3 × (100 × 10) + N (80 × 10)



Incoming unit

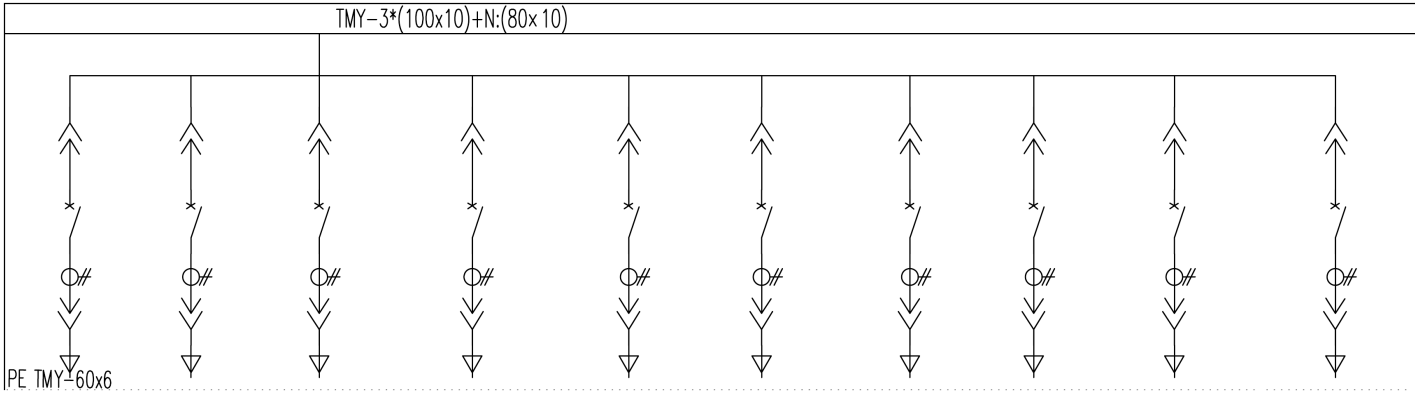
Feeder unit

Bus-tie unit

Scheme Notes

- The schemes above are the standard units we build; circuit count, device ratings and metering of each unit are set from the project single line diagram
- Current transformer ratio, instruments and auxiliary circuits are drawn on the project scheme drawing, not fixed here

Withdrawable Outgoing Unit



Ten drawer circuits in one cabinet

Scheme Units

What each cabinet type contains

Incoming unit	Main switch, current transformers, metering
Feeder unit	Two fixed feeder circuits per cabinet
Bus-tie unit	Tie switch between two busbar sections
Withdrawable outgoing unit	Up to ten drawer circuits per cabinet

GGD — Fixed Assembly

Simple, robust, lowest cost per circuit

- Fixed mounted devices in a bolted cold-rolled steel frame; front access, back-to-wall or double-front arrangement
- Ratings 1600 A / 3150 A / 6300 A with 30 kA / 65 kA / 100 kA short-time withstand current
- Enclosure protection IP30 (1600 A), IP41 (3150 A) and IP42 (6300 A)
- Natural ventilation through top and bottom louvres; no forced cooling needed
- Preferred for incoming, bus-tie and large feeder duty where circuits are few and fixed

Cabinet Arrangement

Frame	Bolted cold-rolled steel profiles
Access	Front only, or front and rear on a double-front line-up
Cabinet widths	800 mm and 1000 mm
Ventilation	Louvres at the top and bottom of every cabinet

GGD — Rated Parameters

Fixed type low voltage assembly

Parameter	Unit	GGD-1600A	GGD-3150A	GGD-6300A
Rated operational voltage Ue	V	400	400	400
Rated insulation voltage Ui	V	690	690	1000
Rated impulse withstand voltage Uimp	kV	6	6	6
Rated frequency	Hz	50	50	50
Rated current	A	1600	3150	6300
Short-time withstand current Icw	kA	30	65	100
Peak withstand current Ipk	kA	63	143	220
Clearance	mm	≥ 10	≥ 10	≥ 10
Creepage distance	mm	≥ 12.5	≥ 12.5	≥ 16
Degree of protection	—	IP30	IP41	IP42
Unit dimensions W × D × H	mm	800 × 800 × 2200	1000 × 800 × 2200	1000 × 800 × 2200
Installation	—	Indoor	Indoor	Indoor

* Design and routine test basis GB/T 7251.12-2023 (IEC 61439-2).

Busbar and Conductors

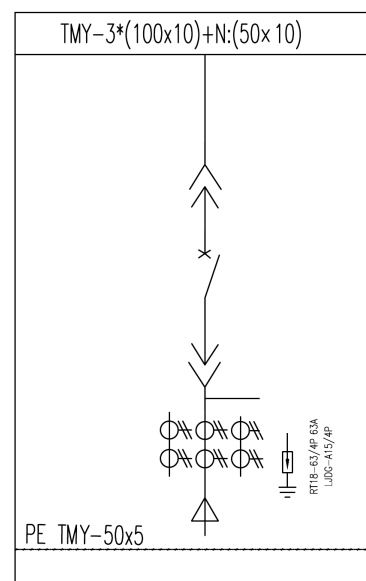
Main busbar material	Hard-drawn electrolytic copper, TMY
GGD main busbar	TMY-3 × (100 × 10) + N (50 × 10) mm
GGD PE busbar	TMY-50 × 5 mm
Busbar supports	Moulded insulators, rated for the declared Ipk
Cable entry	Bottom or top, stated per project

Where it fits

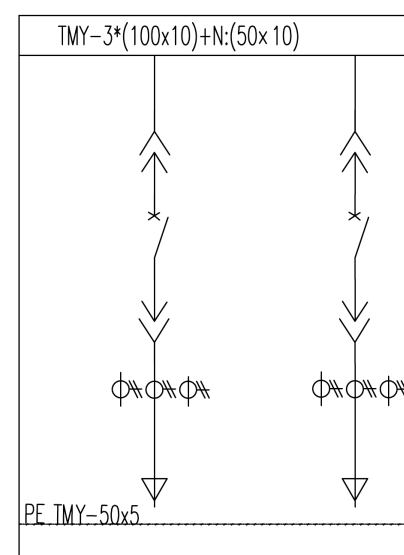
Incoming and bus-tie duty on almost any board, and outgoing circuits that are few, large and unlikely to change. Where the circuit list is long or the plant cannot be stopped to work on one feeder, MNS is the better answer.

GGD Typical Scheme Units

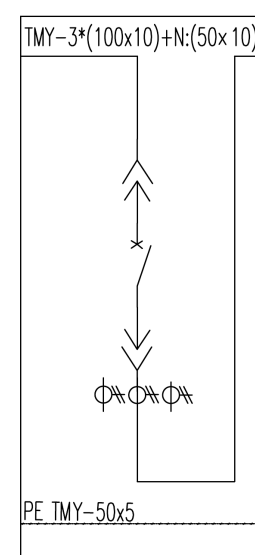
Main busbar TMY-3 × (100 × 10) + N (50 × 10)



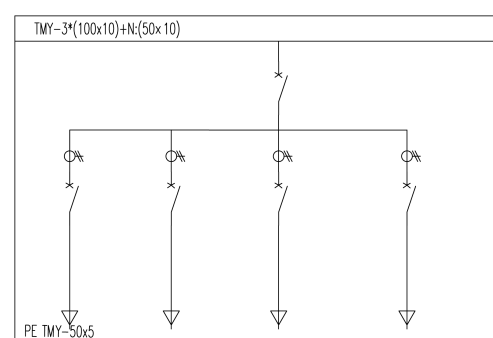
Incoming unit



Feeder unit

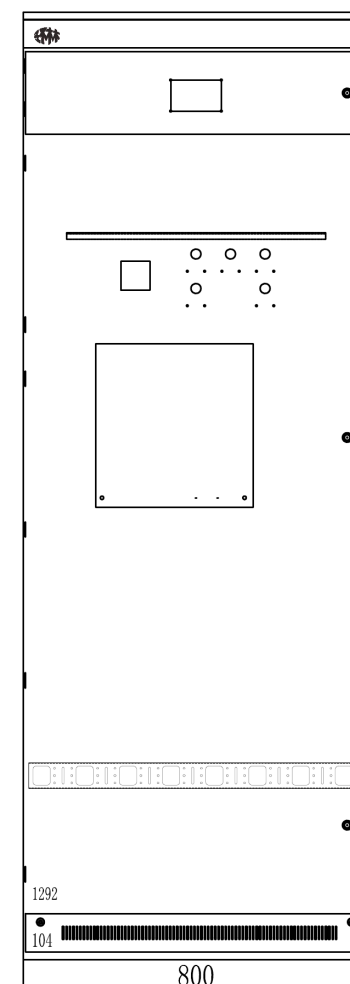


Bus-tie unit

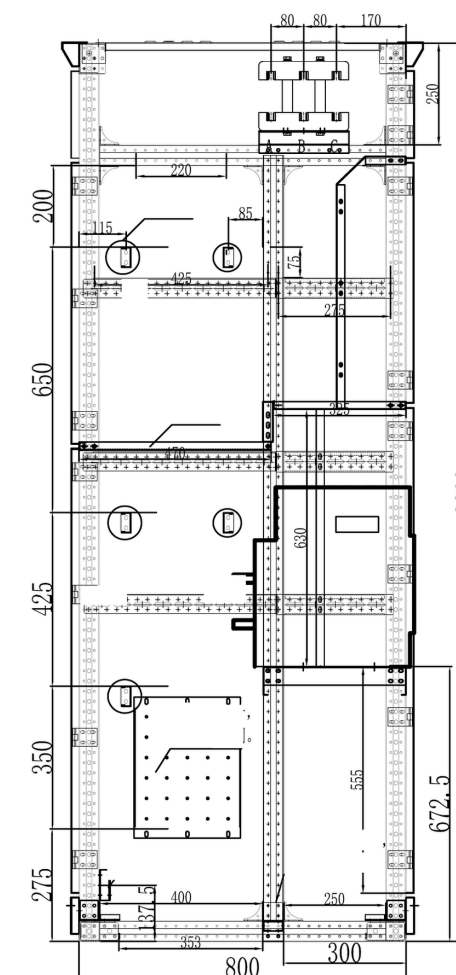


Outgoing unit — four fixed feeder circuits

GGD Fixed Cabinet — Front View and Internal Layout



Front view



Internal layout

Fig. 2 — 800 mm incoming cabinet: device mounting plate, busbar supports and cable zone

Sizing the busbar

Busbar cross-sections above are the standard build. Where the switchroom ambient runs hotter than 35 °C, or the board is fed from both ends, the busbar is re-sized for the project and stated on the scheme drawing.

GGJ — Power Factor Correction

240 kvar in eight switched steps

- Eight capacitor steps of 30 kvar each, switched by capacitor-duty contactors under an intelligent reactive power controller
- Every step carries a 7 % detuned reactor, so the bank can be applied on networks with harmonic load without amplifying the 5th harmonic
- Three-phase self-healing capacitors, 0.45 kV, delta connected
- Common (three-phase) compensation; split-phase compensation on request
- Cabinet 800 × 600 × 2200 mm, IP41, ventilated for capacitor heat load

Standard Step Configuration

Item	Rating	Qty
Self-healing power capacitor	0.45 kV / 30 kvar, three-phase	8
Detuned reactor	0.45 kV / 30 kvar, 7 % detuning	8
Capacitor switching contactor	Ith 63 A, capacitor duty	8
Reactive power controller	Intelligent, 8-step, common compensation	1

Sizing note

240 kvar is the standard cabinet. Step size, number of steps and the detuning rate are set from the measured load and harmonic spectrum — send the power quality data with the enquiry and we configure the bank to it.

GGJ — Rated Parameters

Automatic power factor correction cabinet

Parameter	Unit	GGJ-240
Rated operational voltage Ue	V	400
Rated insulation voltage Ui	V	690
Rated impulse withstand voltage Uimp	kV	6
Rated frequency	Hz	50
Rated total capacitive output	kvar	240
Main busbar rated current	A	481
Compensation mode	—	Common (three-phase)
Capacitor switching element	—	Electromechanical contactor
Short-time withstand current Icw	kA	15
Peak withstand current Ipk	kA	30
Clearance	mm	≥ 10
Creepage distance	mm	≥ 12.5
Degree of protection	—	IP41
Unit dimensions W × D × H	mm	800 × 600 × 2200
Installation	—	Indoor

* Design and routine test basis GB/T 15576-2020.

Busbar Cross-Sections

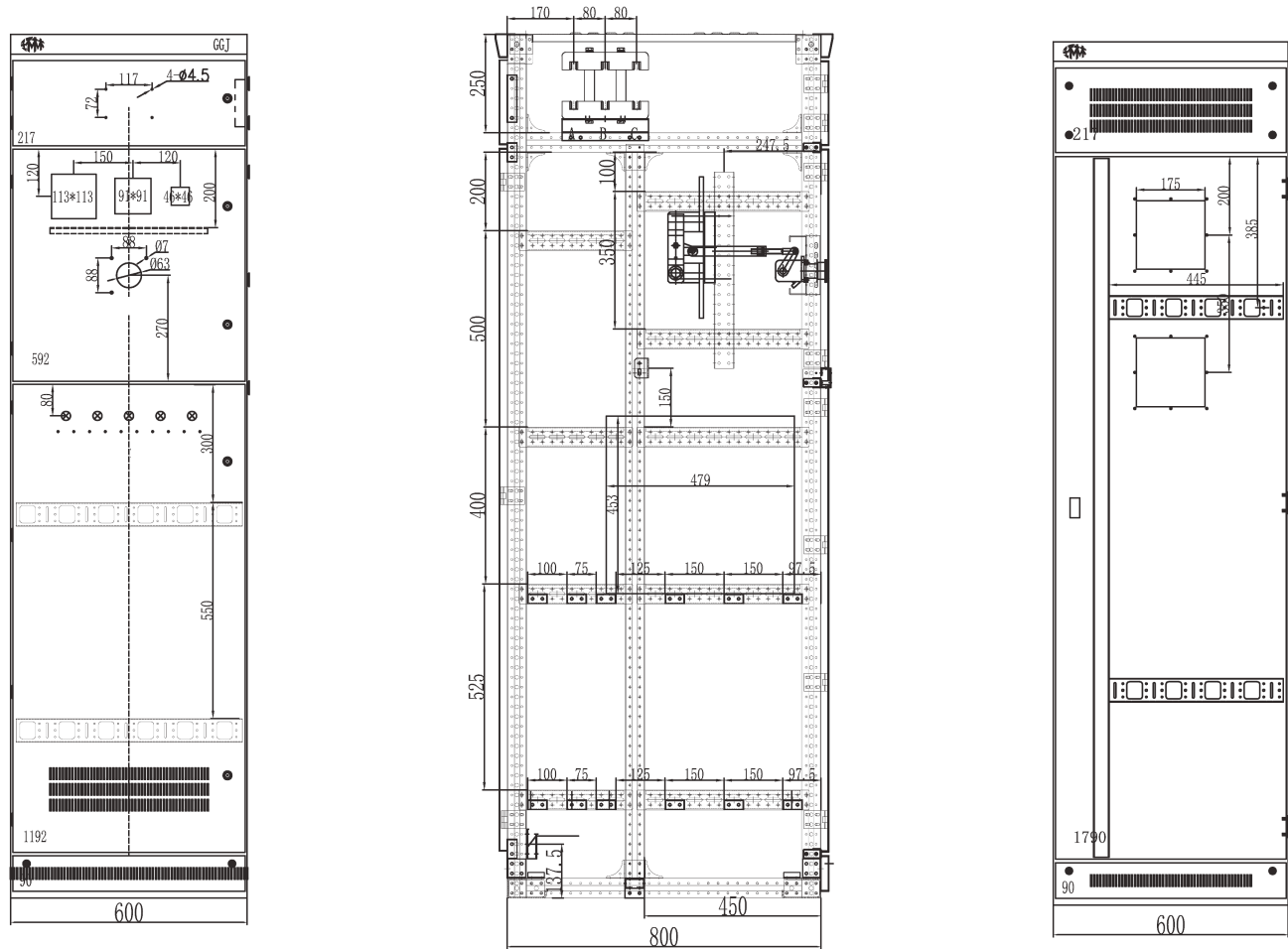
GGJ main busbar	TMY-3 × (60 × 6) + 40 × 6 mm
GGJ PE busbar	TMY-40 × 6 mm

GGJ Cabinet

Front, internal and rear views of the capacitor cubicle

Reactive Power Controller

Front-panel mounted, eight switched outputs



Front view — door, indicator lamps and ventilation

Internal layout — frame, mounting rails and busbar supports

Rear view — louvres and fan openings



What to Specify

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

- Single line diagram or load schedule: incoming, tie and every outgoing circuit with its rated current and duty
- Main busbar rated current and required short-time withstand current
- Withdrawable (MNS) or fixed (GGD) outgoing units, and the internal separation form you require
- Degree of protection, cable entry from top or bottom, front or double-front access
- Reactive power target: measured load, existing power factor and harmonic spectrum
- Site data: altitude, ambient temperature, humidity, seismic requirement
- Auxiliary supply voltage, metering, and any signals to be wired to a control system

Dimensions and Shipping

Cabinet height	2200 mm (all three assemblies)
Cabinet width	600 - 1000 mm depending on unit type
Cabinet depth	600 - 1100 mm depending on rating
Enclosure finish	Powder coated, RAL 7035
Shipping	Assembled in shipping sections, bolted on site

Scope of Supply

Standard	Cabinets, busbar system, devices and internal wiring
Tested	Routine tests and functional check in our works
Documents	General arrangement, scheme drawing, test records
Not included	Incoming and outgoing cables, site earthing, civil works

Lead time

Standard configurations ship in 3 – 4 weeks; a board built to a project single line diagram takes 4 – 6 weeks from drawing approval.

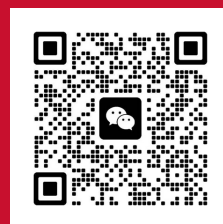
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