



GULF DYNAMIC SWITCHGEAR CO. LTD.



ELECTRICAL ENGINEERS & PANEL MANUFACTURERS

— MAIN DISTRIBUTION BOARDS - FORM 4 —



Manufactured to IEC 439-1 Separation to FORM 4 , Type 1 to 7

- ▶ Rating 600A to 6300A
- ▶ Panels for front access or front/rear access construction
- ▶ Type tested for 80 kA/1 sec
50 kA/3 sec
- ▶ Ample cabling space for easy connections
- ▶ Top and bottom cable entry
- ▶ Protection class IP 31 to IP 54
- ▶ Ambient temperature rating 50°C.
- ▶ Factory built to client's specifications

TECHNICAL DATA

INCOMER ▶ ACB, TP or 4-pole, 600 to 4000 A, 65 to 85 kA, drawout pattern, manual or motor operated. MCCB, TP or 4-pole, 600 to 1600 A, 50 to 85 kA, fixed or plug-in pattern, manual or motor operated.

Load break switch 600 A to 1600 A, TP or 4-pole.

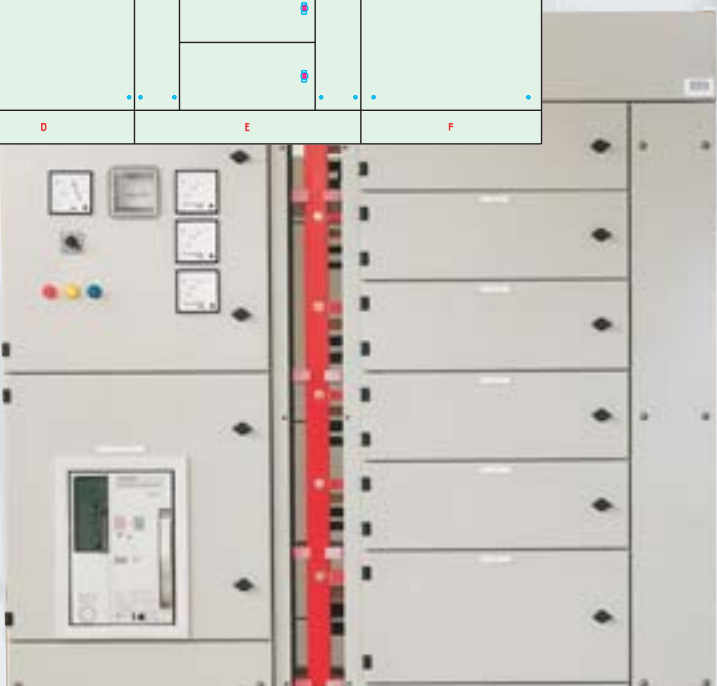
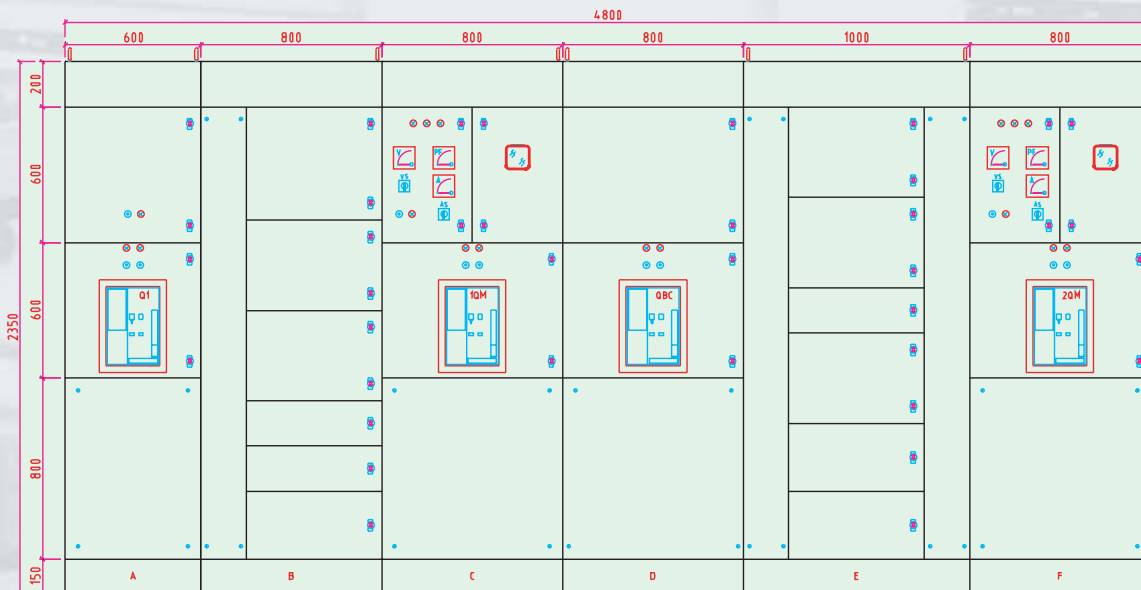
BUS COUPLER ▶ ACB or MCCB as above.
Electrical and/or mechanical interlocking between incomer and bus coupler can be provided, as well as various protection, tripping and indicating functions.

OUTGOINGS ▶ ACBs as above.
MCCBs, TP or 4-pole, up to 1600 A, 30 to 85 kA.
Fuse switches TP, up to 800 A, 100kA.

BUS BARS ▶ H.C.H.D. copper, electrolytically tinned and colour coded.

ENCLOSURE ▶ Electrogalvanized sheet steel 2 mm, polyester powder coated to RAL 7032 textured, with removable rear covers, extendable on either side.

CABLING ▶ Removable gland plates on top and bottom, non-ferrous type for single core cables, drilled to client's requirements.
Termination for up to 4 cables per phase can be provided.



MOTOR CONTROL CENTRES



Manufactured to IEC 439-1 Separation to FORM 4 , Type 1 to 7

- ▶ Rating from 63 A to 2500 A
- ▶ Panels for front access or front/rear access construction
- ▶ Type tested for 80 kA/1 sec
50 kA/1 sec
50 kA/3 secs
- ▶ Draw-out or fixed pattern
- ▶ Ample cabling space for easy connections
- ▶ Top and bottom cable entry
- ▶ Protection class IP 31 to IP 54
- ▶ Ambient temperature rating 50°C.
- ▶ Factory built to client's specifications

TECHNICAL DATA

INCOMER ▶ ACB, TP or 4-pole, 600 to 4000 A, 65 to 85 kA, drawout pattern, manual or motor operated. MCCB, TP or 4-pole, 600 to 1600 A, 50 to 85 kA, fixed or plug-in pattern, manual or motor operated.
Fuse switch 63 A to 800 A, TP or 4-pole
Load break switch 63 A to 1600 A, TP or 4-pole.

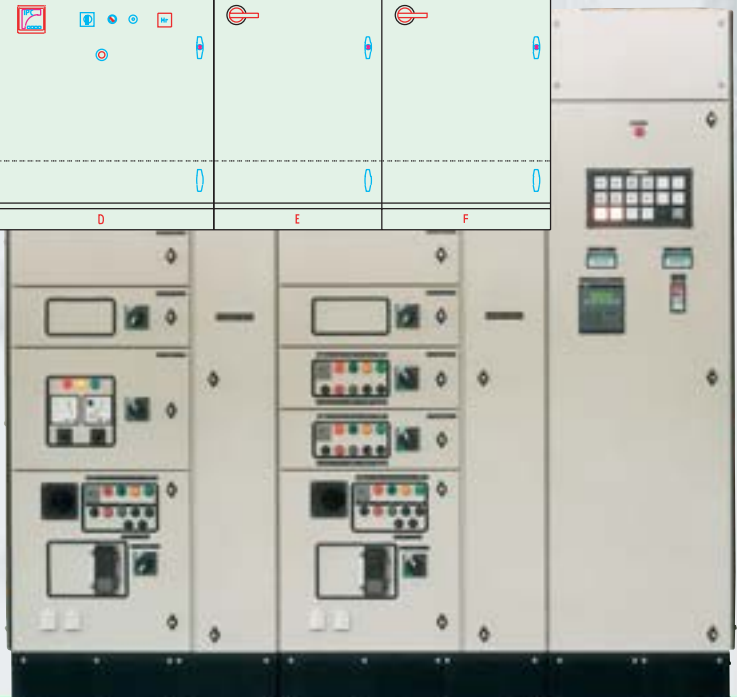
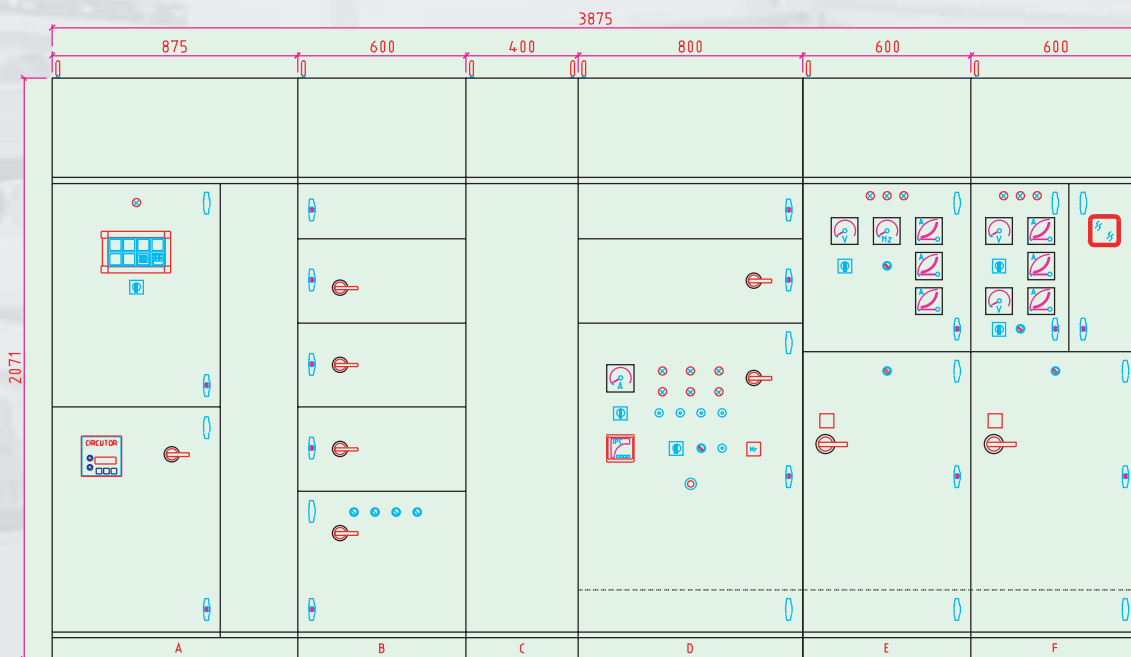
BUS COUPLER ▶ ACB or MCCB as above.
Electrical and/or mechanical interlocking between incomer and bus coupler can be provided, as well as various protection, tripping and indicating functions.

OUTGOINGS ▶ ACBs as above.
MCCBs, TP or 4-pole, up to 1600 A, 30 to 85 kA.
Fuse switches TP, up to 800 A, 100kA.

BUS BARS ▶ H.C.H.D. copper, electrolytically tinned and colour coded.

ENCLOSURE ▶ Electrogalvanized sheet steel 2 mm, polyester powder coated to RAL 7032 textured, with removable rear covers, extendable on either side.

CABLING ▶ Removable gland plates on top and bottom, non-ferrous type for single core cables, drilled to client's requirements.
Termination for up to 4 cables per phase can be provided.



MAIN DISTRIBUTION BOARD - FORM 2



Manufactured to IEC 439-1



- ▶ Separation to FORM 2
- ▶ Rating 630A . . . 6300A
- ▶ Front access for operation and connections
- ▶ Short circuit tested for 50 kA/3 secs
- ▶ Ample cabling space for easy connections
- ▶ Top and bottom cable entry
- ▶ Protection class IP 31 to IP 55
- ▶ Ambient temperature rating 50°C.
- ▶ Factory built to client's specification

TECHNICAL DATA

INCOMER ▶ ACB, TP or 4-pole, 600 to 4000 A, 65 to 85 kA, drawout pattern, manual or motor operated. MCCB, TP or 4-pole, 800 to 2500 A, 50 to 85 kA, fixed or plug-in pattern, manual or motor operated.
Load break switch 600 A to 1600 A, TP or 4-pole.

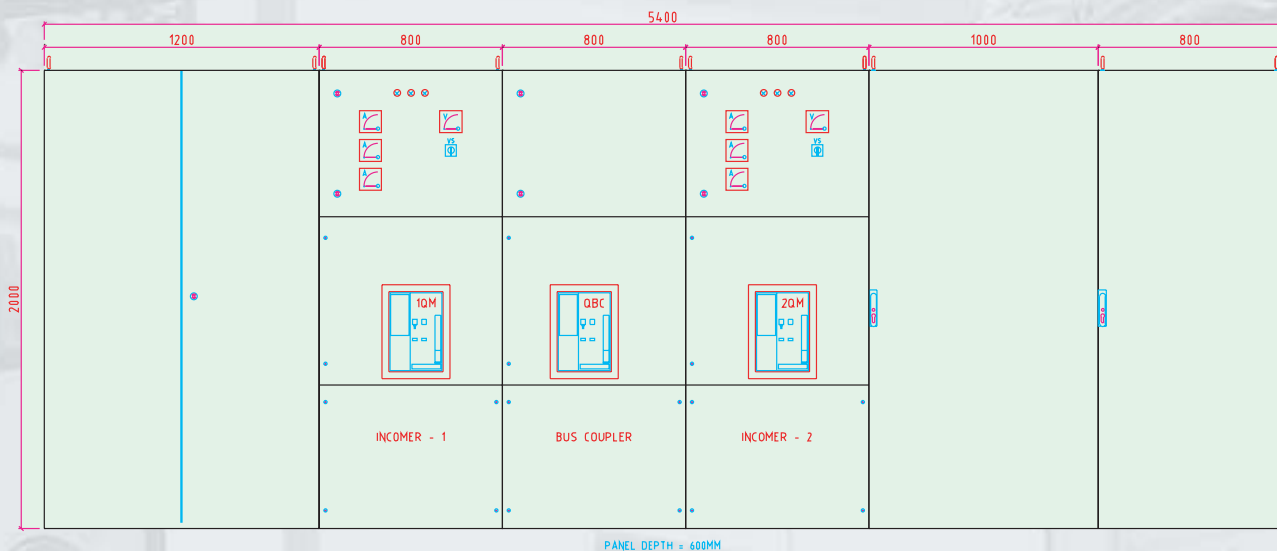
BUS COUPLER ▶ ACB or MCCB as above.
Electrical and/or mechanical interlocking between incomer and bus coupler can be provided, as well as various protection, tripping and indicating functions.

OUTGOINGS ▶ ACBs as above.
MCCBs, TP or 4-pole, up to 1600 A, 30 to 85 kA.
Fuse switches TP, up to 800 A, 100kA.

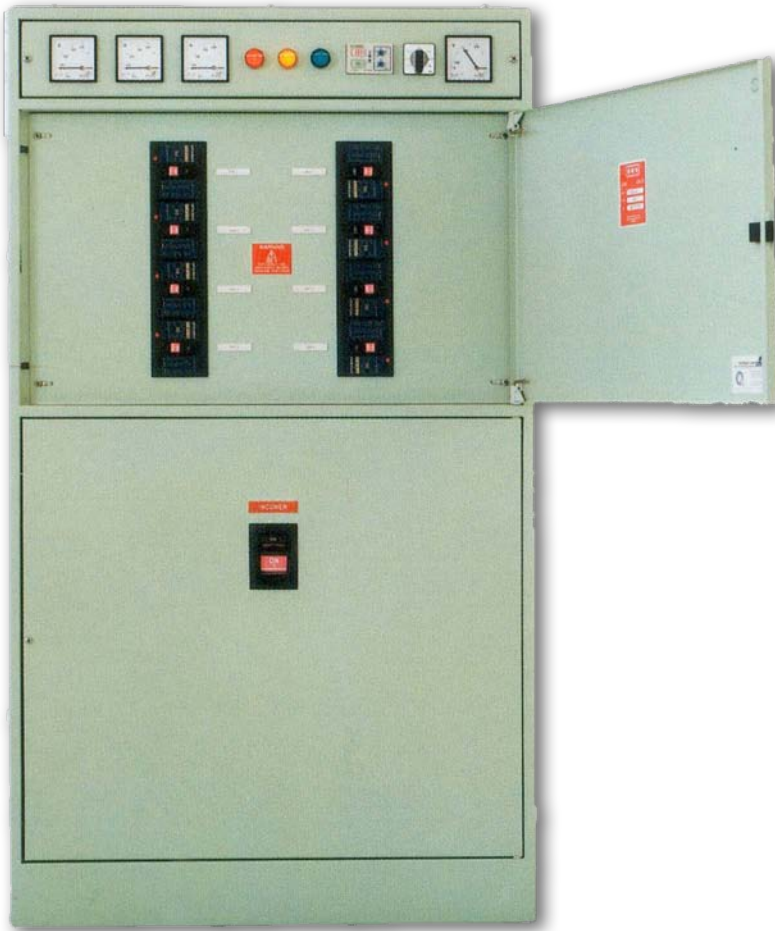
BUS BARS ▶ H.C.H.D. copper, electrolytically tinned and colour coded.

ENCLOSURE ▶ Electrogalvanized sheet steel polyester powder coated to RAL 7032 textured, with removable rear covers, extendable on either side.

CABLING ▶ Removable undrilled gland plates on top and bottom, non-ferrous type for single core cables.
Termination for up to 4 cables per phase can be provided.



MCCB DISTRIBUTION BOARD



LOAD BANK TYPE

- ▶ From 4 to 16 ways, TP
- ▶ Incomer load break switch or MCCB up to 800A
- ▶ Ample cabling space
- ▶ Top, Bottom and Side entry
- ▶ ASTA tested for **36.0kA** short circuit rating
- ▶ Protection class IP **43**
- ▶ Ambient temperature rating 50°C.

GENERAL FEATURES

- ▶ Busbars and incoming terminals are fully shrouded
- ▶ Box type terminals are provided on outgoing MCCBs for termination of cables, reducing connection costs.
- ▶ Metering section and cable plinth can be provided
- ▶ IP 55 outdoor version available.

TECHNICAL DATA

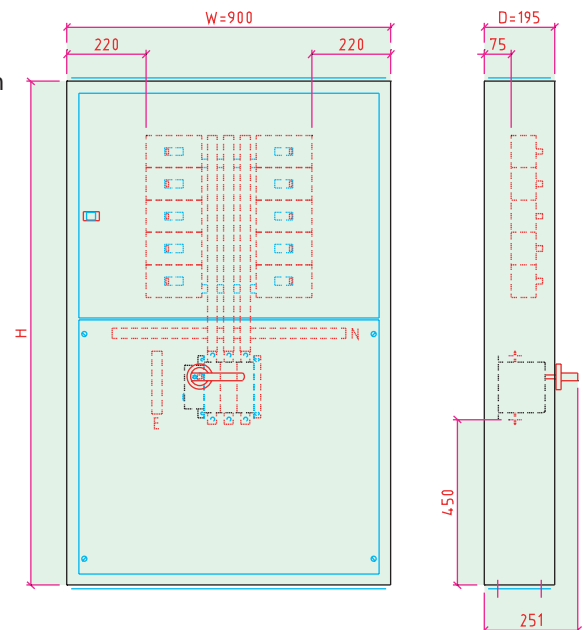
INCOMER ▶ Load break switch 125 to 800 A, 3P with external rotary handle.
MCCB 100 to 800 A, TP, 30kA or 50kA

OUTGOINGS ▶ MCCBs 15 to 250 A, 3P, 30kA or 50kA

BUS BARS ▶ H.C.H.D. copper, electrolytically tinned and colour coded.

ENCLOSURE ▶ Electrogalvanized sheet steel, polyester powder coated to RAL 7032 textured, suitable for floor and wall mounting.

CABLING ▶ Knock-out provisions for various sizes of cables at top, bottom and both sides of the enclosure.

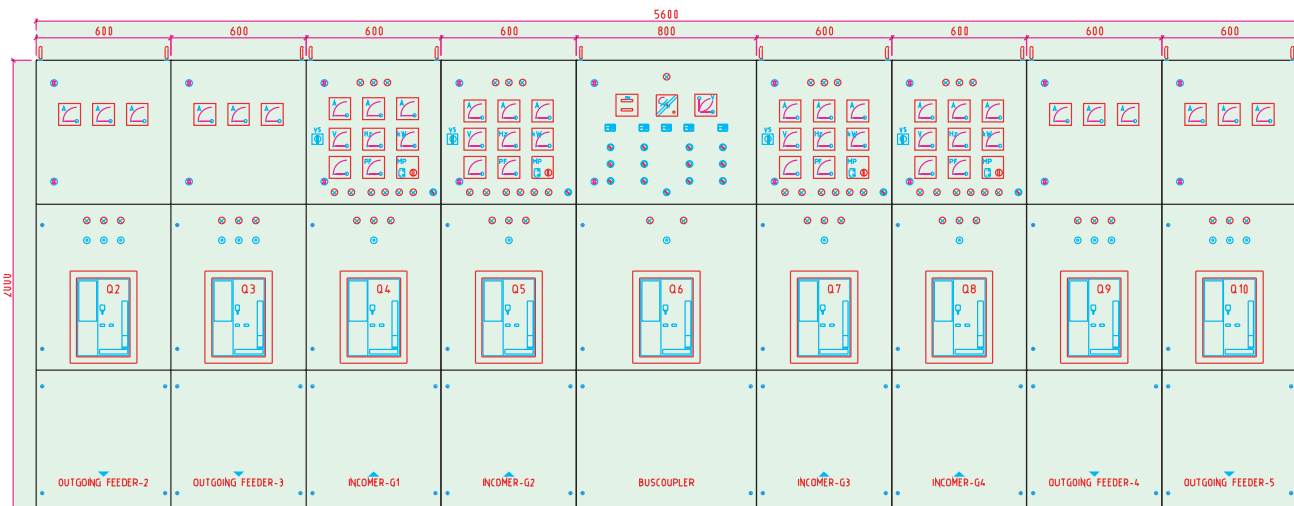


NOTE: 630 A incomer or metering section will occupy the space of 2 outgoing ways.
Other versions available on request

GENERATOR CONTROL PANELS

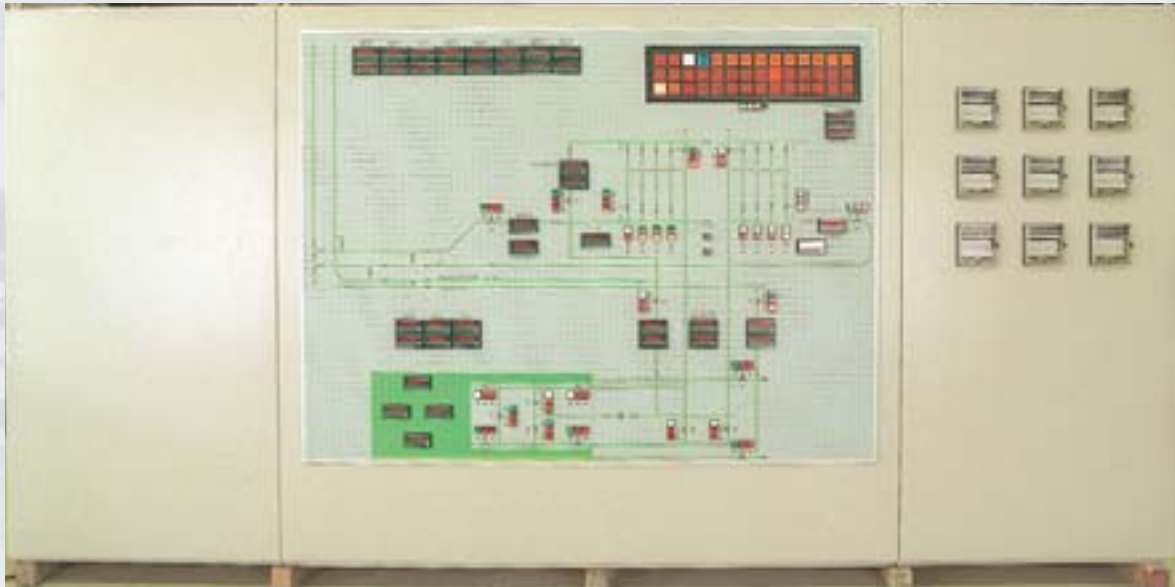
SYNCHRONIZING AND AUTO CHANGE OVER SYSTEMS

- ▶ Factory built to client's specifications
- ▶ Ratings up to 4000A
- ▶ Ambient temperature of 50°C.
- ▶ Automatic and manual synchronizing
- ▶ Load sharing/load shedding
- ▶ Protection class IP 55
- ▶ Various combinations of load transfer by ACBs, MCCBs or Contactors
- ▶ 3-pole or 4-pole system as required
- ▶ Control functions available for engine monitoring, warm-up and cool down periods, emergency shutdown, multi attempt engine start control, engine test runs.



PANEL DEPTH = 600 MM

INSTRUMENTATION / CONTROL PANELS



ENCLOSURE: Electrogalvanized, Sheet Steel, Polyester Powder coated or Stainless Steel

GENERAL FEATURES

- ▶ Designed to client's requirements
- ▶ Built with Mosaic Mimics Process Visualisation equipment and Man Machine Interface
- ▶ Controls by programmable logic control and hard wired relay logic
- ▶ Equipped with optional Alarm Annunciators

APPLICATIONS

- ▶ Industrial Installations
- ▶ Building Management Systems
- ▶ Water Treatment Plants
- ▶ Irrigation Systems
- ▶ Oil & Gas Industry



POWER FACTOR CONNECTION UNITS

TECHNICAL DATA

- INCOMER** ▶ MCCB 40A to 1250A, TP, 50 kA or 25/30 kA Load Break Switch 40A to 1250A, TP
- OUTGOING** ▶ HRC - Fuses, 100 kA
- BUS BARS** ▶ H.C.H.D. copper, electrolytically tinned rated for 50 kA short circuit
- CONTACTORS** ▶ Rated for the size of the capacitors, special contactors for power factor correction capacitors equipped with limiting resistance for the inrush current
- CAPACITORS** ▶ Dry type of the MKP technology, mounted in upright position designed for permanent over voltage of 450V
- REGULATOR** ▶ Microprocessor based with switching program 1:2:4 to allow compensation of low loads. Built-in automatic rotation of capacitor sequence.
- ENCLOSURE** ▶ Electrogalvanized sheet steel, polyester powder coated to RAL 7032
- CABLE ENTRY** ▶ Top or Bottom
- TEMPERATURE** ▶ 50°C.



GENERAL FEATURES

- ▶ Standard ratings from 17.5 to 537.5 KVA
- ▶ Standard sizes according to capacitor ratings
- ▶ Stand alone unit connected by cables or connected to extended main busbars
- ▶ Capacitors fitted with protection caps
- ▶ Temperature controlled by fan
- ▶ Special fixing brackets for the capacitors resulting in increased air circulation
- ▶ Protection class IP 41 to IP 54



DISTRIBUTION BOARDS

SINGLE ROW AND MULTI ROW DIN-TYPE



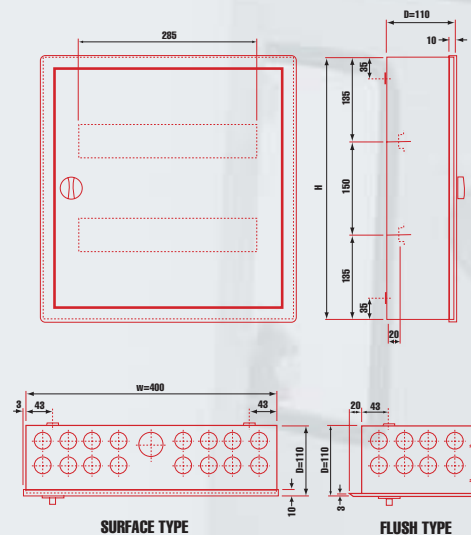
SURFACE TYPE	FLUSH TYPE	NO. OF ROWS	NO. OF MODULES	DIMENSIONS W X H X D	NO. OF LOCKS
CBD 1 S16	CBD 1 F16	1	16	400 X - X 110	1
CBD 2 S16	CBD 2 F16	2	32	400 X 420 X 110	1
CBD 3 S16	CBD 3 F16	3	48	400 X 570 X 110	1
CBD 4 S16	CBD 4 F16	4	64	400 X 720 X 110	2
CBD 5 S16	CBD 5 F16	5	80	400 X 870 X 110	2

TECHNICAL DATA

- INCOMER** ▶ Isolator 2P, 3P or 4P up to 125A
ELCB 2P or 4P up to 100A/100 or 400mA
- OUTGOING** ▶ MCBs 1P, 2P and 4P
6A to 63 A, 63 kA or 10 kA
- BUS BAR** ▶ 5P, 2P, 3P and 4-pole Electrolytic copper up to 125A
Multi pole N+E bars are provided
- ENCLOSURE** ▶ Electrogalvanized sheet steel, Polyester powder coated to RAL 7035
- CABLING** ▶ Knock-outs in top, bottom and sides.

GENERAL FEATURES

- ▶ Surface or flush mounting
- ▶ Standard versions available from 1 to 5 rows
- ▶ DIN rail and cut out of cover to suit 45mm components such as isolators, MCBs, ELCBs, Relays, Contactors, etc.
- ▶ Standard PVC door latch can be provided with cylindrical lock
- ▶ Protection class IP 41



Other versions available on request

TECHNICAL INFORMATION

Calculation of the Capacitor Size

The reactor power which is necessary to achieve a desired power factor is calculated by the following formula:

$$Q_C = P (\tan\varphi_1 - \tan\varphi_2)$$

P Active power of the load to be corrected

Q_C Reactive power of the required correcting capacitor

$\cos\varphi_1$ Original power factor before correction

$\cos\varphi_2$ new power factor

The factor $(\tan\varphi_1 - \tan\varphi_2)$ can be determined by means of the chart below

original power factor		multiplication factor $(\tan\varphi_1 - \tan\varphi_2)$ for a target power factor $\cos\varphi_2$									
$\cos\varphi_1$	$\tan\varphi_1$	0.70	0.75	0.80	0.85	0.90	0.92	0.94	0.96	0.98	1.00
0.20	4.899	3.879	4.017	4.149	4.279	4.415	4.473	4.536	4.607	4.696	4.899
0.25	3.873	2.853	2.991	3.123	3.253	3.389	3.447	3.510	3.581	3.670	3.873
0.30	3.180	2.160	2.298	2.430	2.560	2.695	2.754	2.817	2.888	2.977	3.180
0.35	2.676	1.656	1.795	1.926	2.057	2.192	2.250	2.313	2.385	2.473	2.676
0.40	2.291	1.271	1.409	1.541	1.672	1.807	1.865	1.928	2.000	2.088	2.291
0.45	1.985	0.964	1.103	1.235	1.365	1.500	1.559	1.622	1.693	1.781	1.985
0.50	1.732	0.712	0.850	0.982	1.112	1.248	1.306	1.369	1.440	1.529	1.732
0.55	1.518	0.498	0.637	0.768	0.899	1.034	1.092	1.156	1.227	1.315	1.518
0.60	1.333	0.313	0.451	0.583	0.714	0.849	0.907	0.970	1.042	1.130	1.333
0.65	1.169	0.149	0.287	0.419	0.549	0.685	0.743	0.806	0.877	0.966	1.169
0.70	1.020		0.138	0.270	0.400	0.536	0.594	0.657	0.729	0.817	1.020
0.75	0.882			0.132	0.262	0.398	0.456	0.519	0.590	0.679	0.882
0.80	0.750				0.130	0.266	0.324	0.387	0.458	0.547	0.750
0.85	0.620					0.135	0.194	0.257	0.328	0.417	0.620
0.90	0.484						0.058	0.121	0.193	0.281	0.484
0.95	0.329								0.037	0.126	0.329

Current carrying capacities of Busbars

Copper busbars according to DIN 43761/12.75 (extract), material E-CuF30/F25

Width X Thickness	CONTINUOUS CURRENT							
	Ambient temperature : 35°C Temperature rise : 30°C				Ambient temperature : 50°C Temperature rise : 32°C			
mm	Painted Number of bars		Bare Number of bars		Painted Number of bars		Bare Number of bars	
	I A	II A	I A	II A	I A	II A	I A	II A
20X5	319	560	274	500	319	—	274	—
30X5	447	760	379	672	447	—	379	—
40X5	573	952	482	836	573	—	482	—
50X5	697	1140	583	994	697	—	583	—
20X10	497	924	427	825	497	924	427	825
30X10	676	1200	573	1060	676	1200	573	1060
40X10	850	1470	715	1290	850	1470	715	1290
50X10	1020	1720	852	1510	1020	1720	852	1510
60X10	1180	1960	985	1720	1180	1960	985	1720
80X10	1500	2410	1240	2110	1500	2410	1240	2110
100X10	1810	2850	1490	2480	1810	2850	1490	2480

TECHNICAL INFORMATION

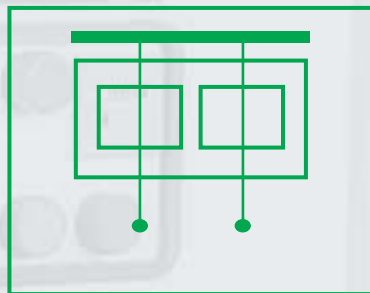
Forms of Separation / Type of Construction

Form 1

No Internal Separation

Form 2

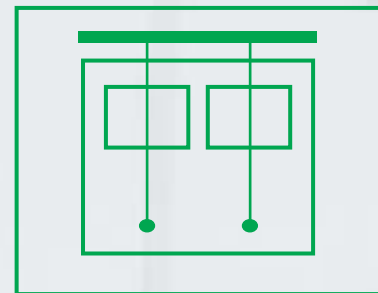
Separation of busbars from the functional units



Terminals NOT separated from busbars

TYPE 1:

Busbar separation by insulated coverings
e.g. sleeving, wrapping or coatings



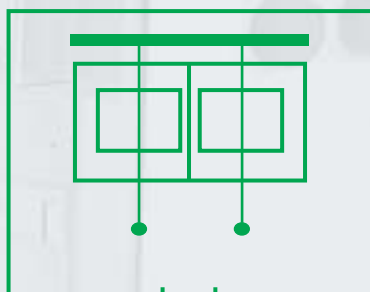
Terminals separated from busbars

TYPE 2:

Busbar separation by metallic or non-metallic rigid barriers or partitions

Form 3a

Separation of busbars from the functional units, Functional units from one another, Terminals from functional units but not from each other



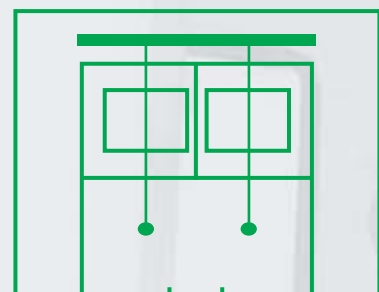
Terminals NOT separated from busbars

TYPE 1:

Busbar separation by insulated coverings
e.g. sleeving, wrapping or coatings

Form 3b

Separation of busbars from the functional units, Functional units from one another, Terminals from functional units but not from each other



Terminals separated from busbars

TYPE 2:

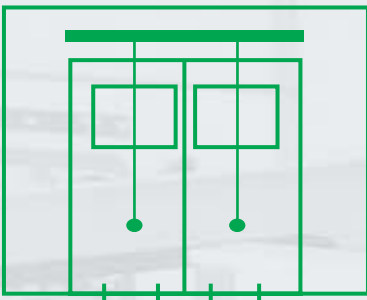
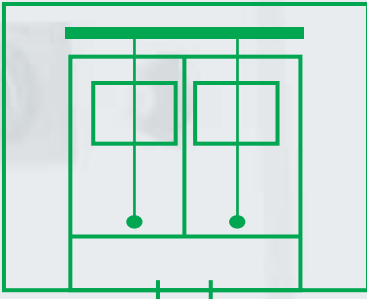
Busbar separation by metallic or non-metallic rigid barriers or partitions

Typical Variants

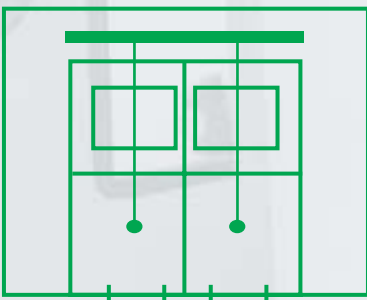
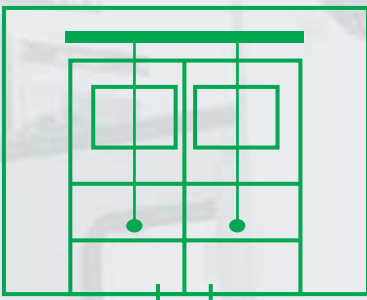
Form 4

Separation of busbars from the functional units, Functional units from one another, Terminals of functional units

Terminals in same compartment as functional unit



Terminals NOT in same compartment as functional unit



Typical Variants

TYPE 1:

Busbar separation by insulated coverings e.g. sleeving, wrapping or coatings. Cables glanded elsewhere.

TYPE 2:

Busbar separation by metallic or non-metallic rigid barriers or partitions. Cables glanded elsewhere.

TYPE 3:

All separation by metallic or non-metallic rigid barriers or partitions. The terminals for each functional unit have their own integral glanding facility.

TYPE 4:

Busbar separation by insulated covering e.g. sleeving, wrapping or coatings. Cables glanded elsewhere.

TYPE 1:

Busbar separation by metallic or non-metallic rigid barriers or partitions. Terminals separated by insulated coverings. Cables glanded in common cabling chamber.

TYPE 1:

All separation by metallic or non-metallic rigid barriers or partitions. Cables glanded in common cabling chamber.

TYPE 1:

All separation by metallic or non-metallic rigid barriers or partitions. The terminals for each functional unit have their own integral glanding facility.

TEST INSTRUMENTS



ASTA TEST CERTIFICATES



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