PATEL ENGINEERING

Get Set Innovate.....

APFC - MCC - PCC
CONTROL PANEL
METER PANEL BOARD

CPRI INDIA TEST REPORT

Approved
Panel Builder

About Us

Patel Engineering is one of the leading manufacturing company for all types of electrical LT Panels which is requires in industries and projects as per relevant national & International standard. Panel manufacturing stages having quality control check at all points thus ensuring safe, reliable, rugged construction at an affordable price. But what sets the company a part from others is the quality and high precision products and the prompt service after sales without delay.

Established in 2010, Patel Engineering is being managed and supervised by ***Mr Divyesh Patel*** who is in the company from beginning. He has come up with the latest technical procedures and practices. The company has an assortment of solutions to offer to the customers. It gives the customers best of all services along with cost effective, economical and affordable price range.

Patel Engineering employees and experts are always engaged in continual innovation and quality improvement in all processes and products. The company boasts of their 24 X 7 service available with a team of experts, technicians & professionals to cater to the customer's demands.

Our Strength

- Patel Engineering started in 2010 with council box and Modular Box.
- Started Electrical panel Unit in 2012.
- Well trained and experienced team of technician, employee and engineers.
- Admirable growth in just 4 year span.
- More than 2000 panel installed
- Manufacturing facilities in our own factory.
- Qualified production manager and service engineers.
- ISO 9001:2008 certified procedure.
- Production capacity 600 panel in per annum

Certification

- Short Circuit Test: Our panels are tested for 4000Amp, 65KA rms for 1 sec, with initial peak of 143KA as per IS:8623 (Part-1), 1993 from C.P.R.I. Bhopal (M.P)
- Degree of Protection: Our Panels are tested for IP-65 Protection class as per IS: 13947 (Part-01), 1993 from C.P.R.I. Bhopal (M.P)
- ISO Certification: ISO 9001-2008 registered JAS-ANZ.

Our Products

- Power Control Center Panel (P. C.C)
- Motor Control Center (M. C.C)
- Automatic Power factor Correction Panel (A.P. F. C)
- Meter Panel Baord (For G.E.B) Meter.
- Main Feeder Panel.
- IP-55, IP-65 Enclosure.
- Control and Relay Panel.
- Busduct

Power control center (P. C. C) Panel

- Main LT Panel/PCC panel with single incomer breaker/Multiple incomer breaker, bus coupler with required protection.
- Panel can be offered either in singl to two tier configuration.
- Interlocking facilities to be provided between DG Incomer and licensee supply with AMF function to cater a power at essential feeder and cutoff power of non essential feeder at the time of failure of mains.
- We offer various designs are in LT Panel/ PCC panel like horizontal busbar chambers in top/bottom/middle. Single busbar, double bus bar system is offer as per client requirement. Top/bottom cable entry with facility to cable termination on Top/Bottom/front/Rear Side.

Busbar

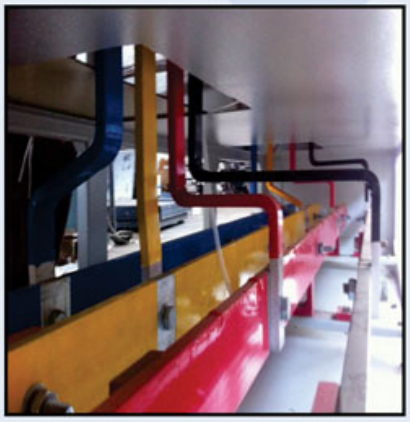
In electrical power distribution, a bus bar is a strip of copper or aluminum that conducts electricity within a switchboard, distribution board, substation or other electrical apparatus.

Busbar making is a special job for LT panel /PCC/Bus Duct. We properly take care with involving experienced engineer to guide our skilled worker & inspection to make zero stressed proper shaping bus bar with proper hardware.

Key features of Power control centers offered by us.

- A high performance and reliability.
- Made from CRCA Sheet / MS Sheet with standard fabrication.
- Powder coated gives elegant look.
- Totally enclosed IP-55 free standing floor mounted indoor/outdoor.
- Panel suitable for 415V AC , 3-Phase , 50 Hz with short circuit rating of 65 KA.
- Panel System both in drawout and non drawout with sufficient space for maintenance.

Busbar Selection



Busbar sizes can not be calculated only from overall size.

There are various derating factors like arrangement of busbar, nos of busbar, spacing, enclosure size, ventilation in room, temp rise, skin effect, proximity effect etc. which need to be consider while designing the bus bar.

Generally current carrying capacity of Aluminum. is 0.80 amp per sqmm and Copper is 1.60 amp per Sqmm.

That does mean 1 sqmm can carry 0.80 amp current.

If size of bus bar is 100mm x 10mm then it can carry 800 amp.

Motor Control Center (M.C.C.Panel)

- Motor control center are of modern design with new generation features in conformation to the requirements of power p[lants, refineries, pharmaceuticals, textiles, engineering and process industries. All starters are provided with type 2 Co-ordination as per clients's specification.
- Motor control centers are simply physical groupings of combination starters in one assembly. A combination starter is a single enclosure containing the motor starter, fuses or circuit breaker, and a device for disconnecting power. Other devices associated with the motor, such as pushbuttons and indicator lights may also be included. These usually comprise of incoming Air Circuit breakers, main horizontal and vertical bus bars, outgoing starter modules with MCCB/ Switch fuse unit, Overload relays, contactors etc. with adequate space for connection of cable and are easily extendable on either side and have excellent short circuit withstand performance of bus bars comprised of bolted/ riverted modular construction.

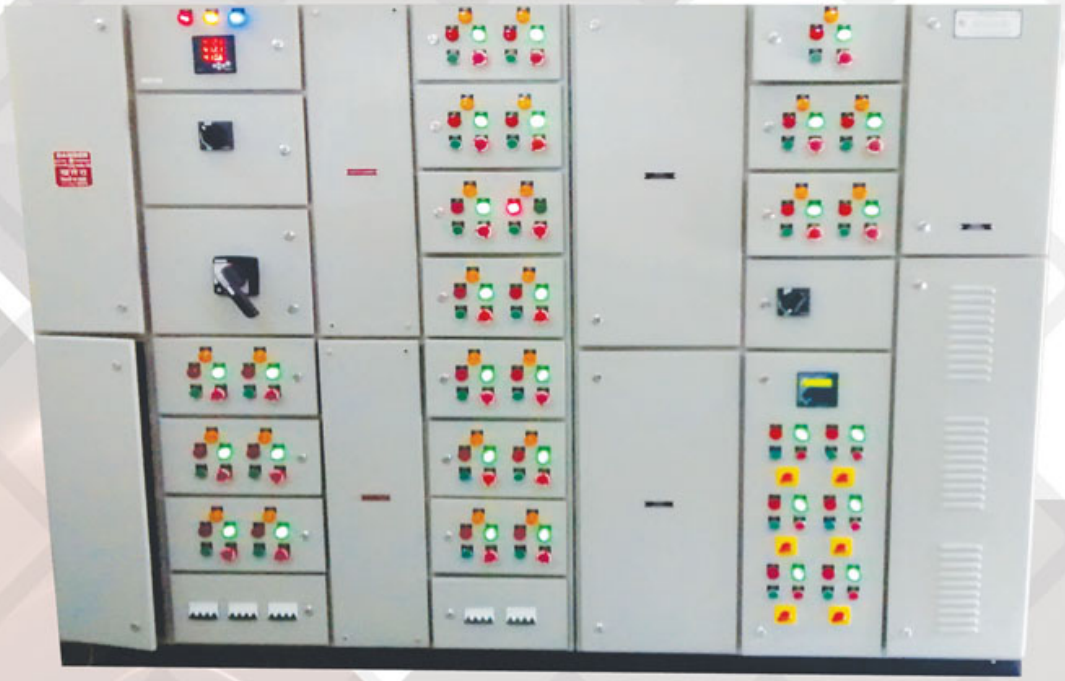
DOL Starter

Many types of electric motor starter is available. DOL is one of the simplest starter. It is comprised of electrical circuit and electro-mechanical parts to starts and stop an electric motor.

A DOL starter connects the motor terminals to the power supply. Hence the motor is subjected to the full voltage of power supply. Consequently, higher starting current flows through motor.

DOL starter is suitable for small motors below 5 HP.

The control circuit is typically run at 220v or 110v or 24v with the aid transformer.

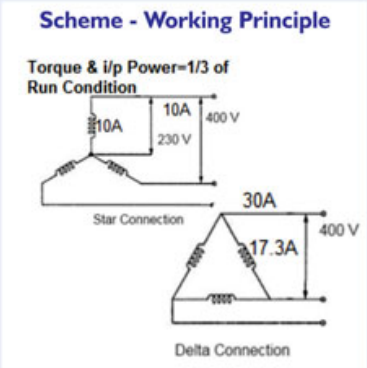


Key features of Motor control centers offered by us.

- Fully type tested assemblies as per IEC 61439-1 rated upto 6300A 65KA.
- Reated operating voltage upto 690V.
- Manufactured to form 2 & form 4 construction, type tested for 65KA/1 aec. Designed for both withdrawable & fixed versions.
- Tailored control using VFD, soft starter & DOL ample cabling space for easy connections top and bottom cable entry.
- Panels for front or rear access to suit application index of operation: IP55/56 & IP-65
- Floor mounting
- Maximum safety & reliability
- Modular system with customized design to meet end user requirement.

Star-Delta Starter

- This is the reduced voltage starting method. Voltage reduction during star-delta starting is achieved by physically reconfiguring the motor windings as illustrated in the figure below. During starting the motor windings are connected in star configuration and this reduces the voltage across each winding
- This also reduces the torque by a factor of three.
- After a period of time the winding are reconfigured as delta and the motor runs normally. Star/Delta starters are probably the most common reduced voltage starters. They are used in an attempt to reduce the start current applied to the motor during start as a means of reducing the disturbances and interference on the electrical supply.



Automatic Power Factor Correction (APFC)

Definitions

The design of the APFC equipment involves the following major Parts and the selection of these depends very much on the above System conditions.

Enclosure:

protects the APFC system components against the External solid or liquid particles and also provide protection for Human beings.

PFC Controller:

Is the brain of the APFC system, which Switches ON / OFF the steps depending on the kvar required in Order to maintain the PF close to unity.

Bus bars:

Bus bar is the electrical conducting path, to which all the components in the APFC system are connected.

Switchgears:

Switchgears are the devices which control the Circuit under faulty and normal conditions. Switchgears protect the APFC system against faulty conditions.

Cables:

Cables are used to connect various components in the steps. Proper cable sizing has to be considered for a particular step depending on the rated current and the operatingtemperature in order to link the various components of the system. Cables loop the power circuit & control circuit in the system.

Protection devices:

Protection has to be provided to safeguard the capacitors and other components due to abnormalities in the system. The incoming switchgear of the APFC system should be tripped by protective devices.

Reactors:

Reactors are used in steps as detuned filters and are connected in series with capacitors. It must be designed to withstand fundamental and harmonic currents.

Capacitors:

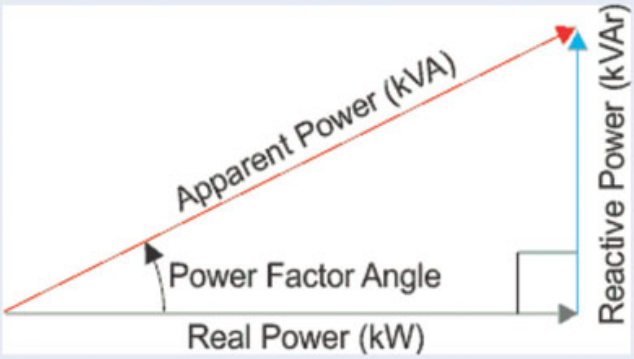
Capacitors forms the core component in APFC equipment and plays a vital role in power factor correction. Proper selection of capacitors is very much necessary to comply with the applications.

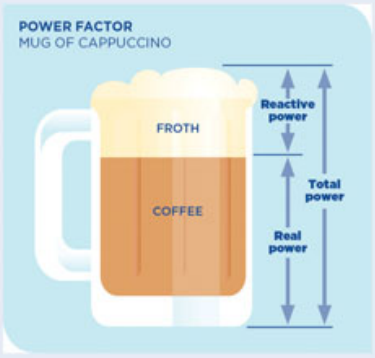
Note: The above components are explained further in details

Applicable standards and definitions of (APFC)

Applicable Standards

- **IEC61921:** (Power Capacitors- Low voltage power factor correction banks) is the international standard applicable for Low Voltage Power Factor Correction Banks and Automatic Power Factor Correction (APFC) equipments intended to be used for power factor correction purposes, equipped with built in switch gears and control gears. The guidelines for design, installation, operation and safety of APFC panels are followed based on this international standard. The design of the Low Voltage Power Factor Correction banks and accessories shall comply with the following standards
- **EC60831:** Part 1 & 2-Shunt power capacitors of the self healing type for a.c systems having rated voltage up to and including 1 kV.
- **IEC 60439-3:** Low voltage switchgear and control gear assemblies. Particular requirements for low-voltage switchgear and control gear assemblies intended to be installed in places where unskilled persons have access for their use-Distribution boards.
- **IEC 60947:** Low Voltage Switchgear Part 2: Molded Case Circuit Breakers & Air circuit Breakers Part 4: Power Contactors Part 4-3: Thyristor Switch.
- **IEC 60269:** LV Fuses.
- **IEC 60076-6 :** Reactors.
- **IEC 60529:** Degree of protection provided by enclosure (IP Code).
- **IEC 60044-1:** Current transformers.
- **IEC 60664-1: IEC 61326:** Power Factor Controller.





Automatic Power Factor Correction (APFC)

Investment in APFC panel is a very smart decision.

- APFC panel protects the customer from poor power factor and associated problems.
- Poor power factor leads to following problems.
- Excessive KVA demand for a given KW load resulting in higher electricity bill penalty from the state electricity board.
- High line currents resulting in high ohmic losses.
- Excessive voltage drops and voltage fluctuation harming the equipment and reducing their efficiency.
- It is true that a properly designed APFC panel pays back for itself in a very short time span.

Options/ Optional Accessories

- Thermostat for control of the exhaust fan.
- Alarm becon.
- Unit for PF logging and USB port for connectivity with PC.
- Detuned capacitor banks [additional harmonic filter reactors] for locations with high harmonics.
- Reactor units for fast discharging of capacitor banks.
- Relay for remaote alarm communication.

Advantages:

- Reduces line voltage drops
- Limits load-dependent voltage drops
- Influences load flow in parallel transmission lines
- Increases transfer capability
- Reduces transmission angle
- Increases system stability

Disadvantages:

- Once a capacitor in a transmission line gets damaged, then the entire power flow scheme is interrupted
- Maintenance is difficult

Main Feeder Panel

- Use for Compound and Lighting
- Outdoor Mounting
- IP-55, IP-65 Feeder Panel Metal Enclosure

Meter Panel Board

- Use for Electricity Meter
- Wall Mounting , Floor Mounting
- IP-54, IP-55 Metal Enclosure

Manufacturing Parameters

Construction Features

- Modular / Compartment & Non Compartmentalized Construction.
- Panel Structure with C.R.C.A Steel Sheet / Stainless Steel Sheet.
- Single Front / Double Front Operated & Free Standing Type.
- Double Door Provision for Outdoor Type Panel.
- Provision for Extensible for both sides.
- Neoprene Rubber Gaskets to be used to avoid atmospheric effect and restrict dust & vermin proof to meet IP Protection like IP-42 / 52 / 54 / 55 / 65.
- Arrangements for Heat Dissipation by means of Exhaust Fan / Louvers.
- Fabrication work on CNC / Hydraulic / Laser Machine.

Pre Treatment and Painting

- Sand Blasting / Seven Tank Pre treatment Process Includes degreasing, Derusting, Phosphating and passivation.
- Final paint shade as per IS or client Specification.
- Synthetic Enamel / Epoxy based primer / powder coating as per customers' requirement.

Busbar Arrangement and Cable Alley

- Segregated Aluminium / Copper EC Grader Busbar.
- Main Busbar Chamber at the Top / Bottom / Middle.
- Separate chamber for vertical busbar droppers.
- Busbar System design on basis of continuous current rating and fault with-stand capacity considering allowable temperature rise as per IS 8623 or as per specification.
- Busbar Supports of SMC / DMC Material.
- Simple dimensioned vertical cable alley for easy termination.
- Cable entry from Top or Bottom. Detachable Gland plates are provided for cable entry.

Assembly & Wiring

- Selection of Switchgear / Components from Approved Make List and as per approved drawings.
- Design of Internal Layout for optimum using of space.
- Internal Control & Power wiring with 660 / 1100 V Grade PVC Coated stranded Copper Flexible wires.
- Crimping Lugs are used for internal connection / Termination.

Identifications

- Identification labels provided on each component.
- Internal wiring with Printing Sleeve Ferrules at the both end of wire.
- Aluminium Anodize labels are provided on each feeder with Rating, Description & Tag. No.
- Identification Labels are provided on Busbar Chambers, Cable Alley, and Live Busbar Power Allow & Danger Plates etc.
- We use latest technology of ferrule / lable printing machine for labeling work.

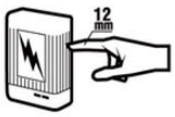
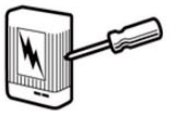
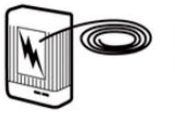
Quality Control Systems

- Inspection of fabrication Structure for dimensions as per approved G.A. Drawings.
- Inspection of Painting / Powder Coating.
- Physical Inspection & Internal Testing of Control & Power wiring.
- Routine Test are conducted on each panel like

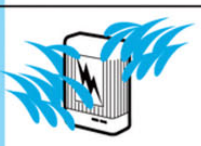
1. Insulation Resistance Test with 1000V DC Meggar.
2. H.V. Test.
3. Functional Test.

IP (Ingress Protection) Ratings Guide

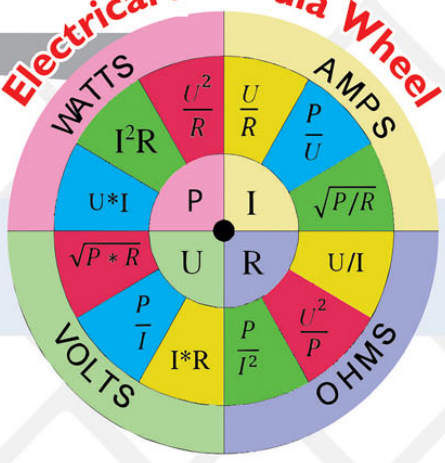
SOLIDS

1		Protected against a solid object greater than 50 mm such as a hand.
2		Protected against a solid object greater than 12.5 mm such as a finger.
3		Protected against a solid object greater than 2.5 mm such as a screwdriver.
4		Protected against a solid object greater than 1 mm such as a wire.
5		Dust Protected Limited ingress of dust permitted. Will no interfere with operation of the equipment. Two to eight hours.
6		Dust tight. No Ingress of dust. Two to eight hours.

WATER

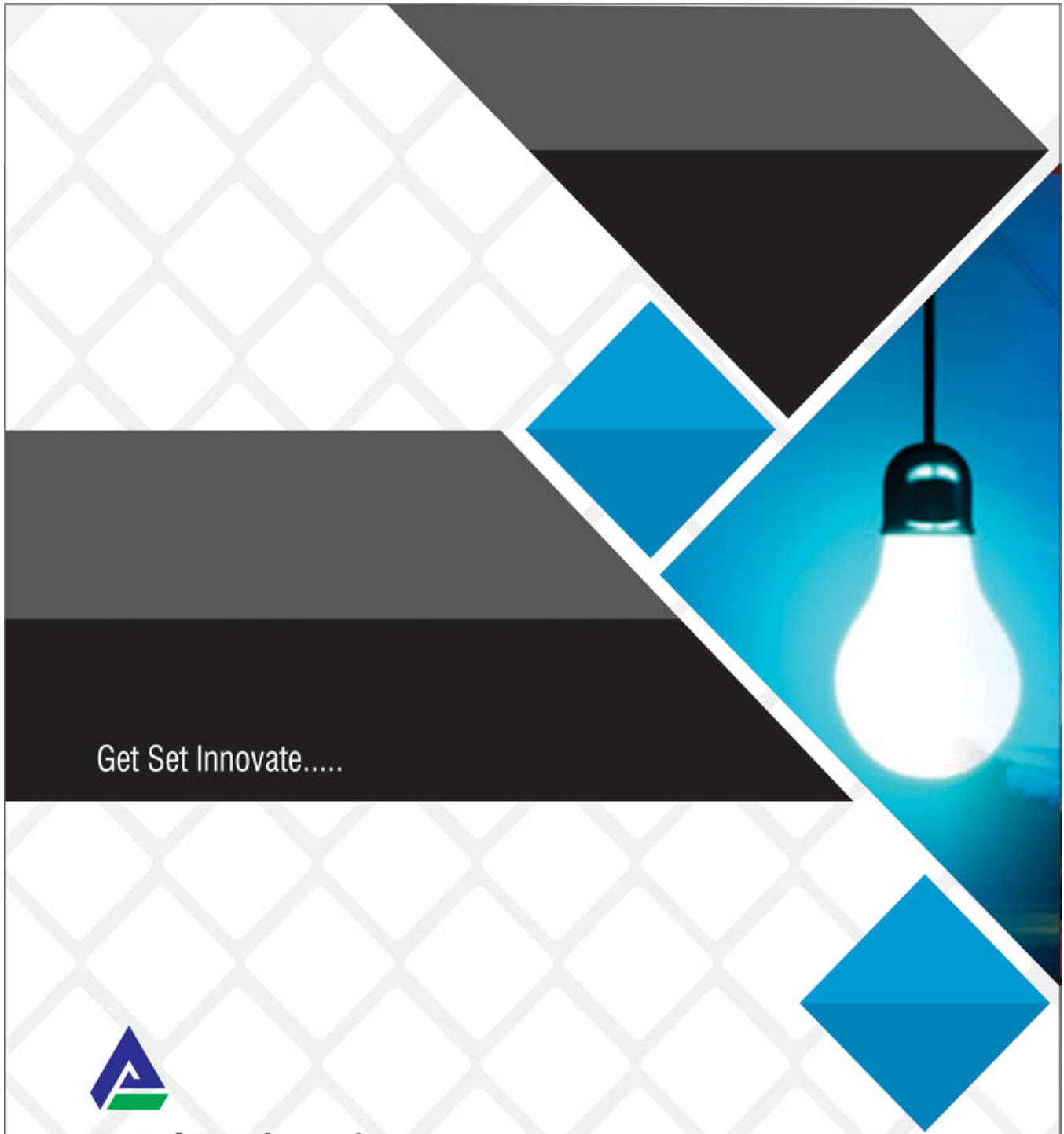
1		Protected against vertically falling drops of water. Limited ingress permitted.
2		Protected against vertically falling drops of water with enclosure tilted up to 15 degrees from the vertical. Limited ingress permitted.
3		Protected against sprays of water up to 60 degrees from the vertical. Limited ingress permitted for three minutes.
4		Protected against water splashed from all directions. Limited ingress permitted.
5		Protected against jets of water. Limited ingress permitted.
6		Water from heavy seas or water projected in powerful jets shall not enter the enclosure in harmful quantities.
7		Protection against the effects of immersion in water between 15 cm and 1 m for 30 minutes.
8		Protection against the effects of immersion in water under pressure for long periods

Rating Example:



Degree of Protection :

Our Panels are tested for IP-65 Protection class as per IS: 13947 (Part-01), 1993 from C.P.R.I. Bhopal (M.P)



Patel Engineering

8, Anand Industrial Estate
Opp. Yamuna Mill,
Dabhoi Road, Pratap Nagar,
Vadodara-390004 (Guj.) India

www.pateleng.co.in

sales@pateleng.co.in
info@pateleng.co.in

Mo. : 91-094 273 53 908
Toll Free :1800 274 4411

For More Details: