

# BITORON-600

## LV Panel System

Rated upto 6300A-100kA-1000V



### **Adaptation of New Standard Low voltage switchgears**

Fully Design Verified Assemblies  
(conforming to IEC 61439)

for:

- industry
- infrastructures
- construction
- utilities

## Bitoron 600

Bitoron 600 has been made in compliance to IEC 61439 where TTA has been superseded by Design Verification. Three alternative methods are carried out to verify the design of the low voltage switchgear and controlgear assemblies:

- Testing
- Calculation/ Measurement
- Application of Design Rules

## Classification of Design Verification

Characteristics to be verified	Verification by Testing	Verification by Calculation	Verification design Rules
Strength of material and parts	Yes	No	No
Degree of protection of enclosures	Yes	No	Yes
Clearances and creepage distances	Yes	Yes	Yes
Effective continuity between parts and PE	Yes	No	No
Effectiveness of the assembly for external faults	Yes	Yes	Yes
Incorporating of apparatus	No	No	Yes
Internal electrical circuits and connections	No	No	No
Terminals for external conductors	No	No	Yes
Power frequency withstand voltage	Yes	No	No
Impulse withstand voltage	Yes	No	Yes
Temperature rise limit	Yes	Yes	Yes
Short-circuit withstand strength	Yes	Yes	Yes
Electromagnetic compatibility (EMC)	Yes	No	Yes
Mechanical operation	Yes	No	No

### Temperature Rise Calculation:

Temperature Rise verification is done by calculation in accordance with IEC 60890 with additional margin. Two calculation methods are used as the following :

- single compartment assembly by calculating total power loss of the assembly
- multiple compartment assembly by calculation in accordance to IEC 60890

### Power Loss Calculation:

Power loss calculation is done by using the formula as per IEC 61439

## Bitoron - 600

A fully assembled low voltage systems

### Introduction

Bitoron - 600 is a modular LV distribution & control system with possibilities of extension or modifications. Access to connections is either from the front or the rear.

The switchgear is installed in fixed or draw - out chassis which may contain :

- circuit breakers for control & protection of circuits
- contactors for control & protection of electric motors.
- switches & fuse switches can be associated with other devices.
- automatic and control devices inclusive of speed variators for ac/dc electric motors, electromagnetic or static relays, programmable controllers, reactive power regulator
- capacitors for power factor correction
- metering.

### Applications

bitoron - 600 is used to compose LV boards upto 1000V for all type of application.

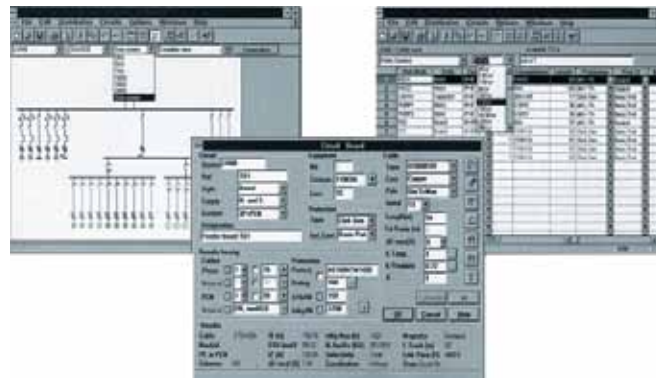
- LV power distribution
- process control
- motor control centers
- distribution for commercial & industrial installations
- power factor improvement.

### Optional features

- PF measurement
- LV kwh metering
- Harmonics measurement
- outgoing feeder metering
- frequency metering
- earth fault & over / under voltage protections
- paint finish colour of customers choice.



The design works are performed using special softwares to comply standards IEC 61439 & electro - medical regulations IEC 60364



## Characteristics

### General

#### Standards

Bitoron - 600 complies with the main international standards:

- IEC 61439 - 2 relating to construction of low voltage switchgear and controlgear assemblies,
- IEC 60529 defining the degrees of protection provided by enclosures,
- IEC 60068-2-11 defining resistance to salt mist,
- IEC 60068-2-30 defining resistance to damp heat.

#### Construction

- metal frame: folded sheet metal,
- paint: epoxy powder polymerised at high temperature
- plastic components : self-extinguishing in particular the supports for bare live conductors.

#### Connections

- front and/or rear access,
- conductor entry from top and/or bottom.

#### Switchgear

- 3 or 4 poles.
- three types of electrical connections:
  - fixed,
  - plug-in,
  - withdrawable.



### PE conductor Power circuit

Cross - section of protective conductor PE

#### Optimised method:

Use the calculation formula given by standard IEC 61439-1

$$S_{PE} = \frac{\sqrt{I^2 t}}{K}$$

- $S_{PE}$ : cross - sectional area of PE in mm<sup>2</sup>
- $I^2$ : value of the phase-to-earth fault current = 60% of the value of the phase -to-phase fault current (standard IEC 61439-1 §8.2.4.2)
- t: duration of the fault current in seconds
- K: a factor depending on the conductor material, K = 143 for a PVC - insulated copper PE conductor.

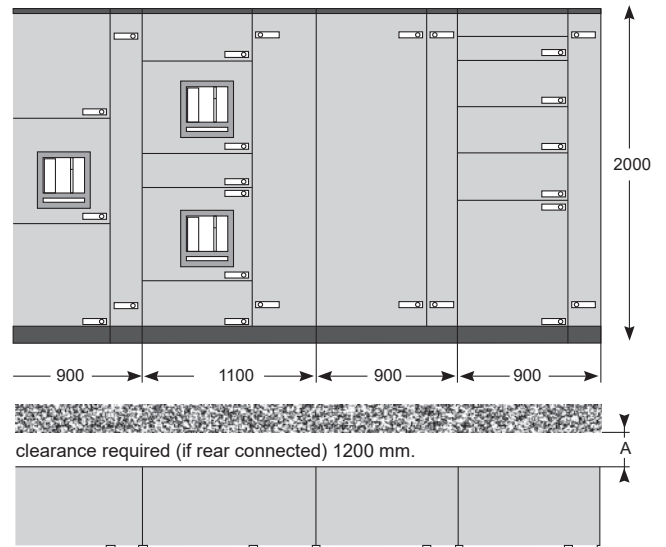
#### Simplified method (based on the above formula):

- Use the table below.
- Depending on the  $I_{sc}$  of the device, determine the cross-sectional area of the PE conductor :

Cross-sectional Area of the PE conductor (mm)	MG/AB/SQ-ACB With a 0.5 second time delay	Other MG/AB/SQ device
$I_{sc} \leq 40 \text{ kA}$	1 bar 25 x 5	1 bar 25 x 5
$40 < I_{sc} < 50 \text{ kA}$	1 bar 50 x 5	1 bar 25 x 5
$I_{sc} \geq 50 \text{ kA}$	1 bar 50 x 5	1 bar 50 x 5

### Electrical

Type	Fixed/Draw	
Rated Voltage		
Rated insulation voltage	1000 V AC	
Rated operational voltage	690 V AC	
<b>Current</b>		
	Single busbars	double busbars
Rated short-time current	up to 50 kA	up to 85 kA
Rated peak withstand current	up to 100 kA	up to 187 kA
<b>Rated current</b>		
Main busbar	up to 4000 A	up to 6300 A
Distribution busbar	up to 3200 A	
<b>Mechanical</b>		
Forms	1-2b-3b-4b	
Degree of protection	IP 20-31-42-54	
<b>Dimensions (mm)</b>		
Width	700/900/1100/1200/1300	
Depth	500/700/1000	
Overall height	2000	
Functional height	40 modules of 50 mm	



as standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

## Bitoron - 600

an evaluative panel assembly conforming IEC 61439-2 standards and IEC 364 electro - medical regulations.

IEC 61439 covers LV switchgear and controlgear assemblies, manufactured and type tested as complete units. certain types of distribution boards (in particular, functional distribution boards) in which all component parts are individually subject to IEC 60947, also shall conform to specific recommendations of IEC 61439

IEC 61439 defines four "forms" of assembly, according to the degree of internal separation, by barriers or partitions, in different compartments.

### the separations provide:

- protection against contact with live parts of adjacent functional units
- limitation of the probability of initiating arcing faults
- protection against the passage of foreign solid bodies from one unit of the assembly to an adjacent unit.

### Various types of partitioning are available.

They make it possible to build Form 2,3 and 4 electrical switchboards.

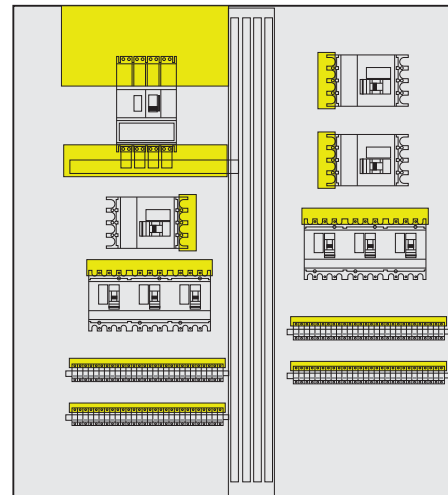
The form of separation is covered by an agreement between the manufacturer and the user.

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## Minimum protection recommended for maintenance operations

### The recommended protection includes:

- barriers on the horizontal and vertical transfer busbars to protect against accidental direct contact with live parts.
- upstream partitioning of the incoming device so that maintenance can be carried out safely once this device is in the "OFF" position.



## Internal partition

As for MV assemblies, partitions consist in interconnected and earthed metal plates. In bitoron systems, these partitions may divide the section into 4 compartments :

- Switchgear compartment
- Auxiliary compartment
- Busbar compartment
- Connection compartment ensuring, thus a high degree of safety.

The auxiliary devices accommodated in one of the compartment are inherently protected against thermal, electrical and mechanical stresses produced by "power".

Each compartment has a degree of protection equal to IP 20.

Partitions between individual compartments will be provided or omitted. depending on whether the assembly is form 2,3 or 4, according to definitions contained in publication IEC 61439

## Definition of form 2

- separation of busbars from the functional units:
- protection against contact with live parts upstream from outgoing devices
- limitation of the risk of propagation of short-circuit currents between functional units and busbars (electrical arcs or solid bodies).

### Two types of form 2 separation as specified by standard IEC 61439

#### ■ form 2a:

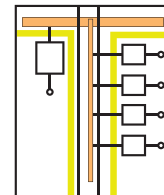
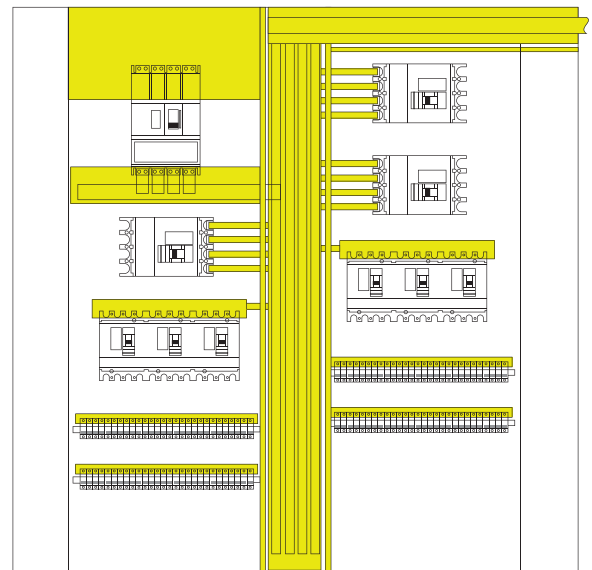
Terminals for external conductors not separated from the busbars. Functional units are separated from the busbars, but not the terminals for external conductors

#### ■ form 2b:

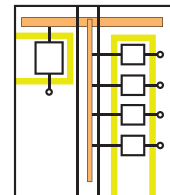
Terminals for external conductors separated from the busbars. Functional units and terminals for external conductors are separated from the busbars.

Bitoron offers form 2b separation:

- with partitioning between main and distribution busbars
- for the protection of persons, Adex recommends in addition:
- partitioning of upstream and downstream connections on the incoming device (form 4 on incoming device)
- use of prefabricated connections with integrated terminal shields or installation of upstream terminal shields on outgoing devices.



Form 2a



Form 2b

## Definition of form 3

Separation of busbars from the functional units and separation of all functional units from one another. Separation of the terminals for external conductors from the functional units but not from one another.

- protection against contact with live parts.
- limitation of the risk of faults between each of the functional units (propagation of electrical arcs, etc.)

### Two types of form 3 separation as specified by standard IEC 61439

#### ■ form 3a:

Terminals for external conductors not separated from the busbars. The functional units are separated from one another and from the busbars, but the terminals for external conductors are not.

#### ■ form 3b:

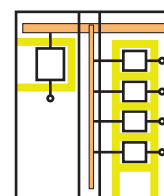
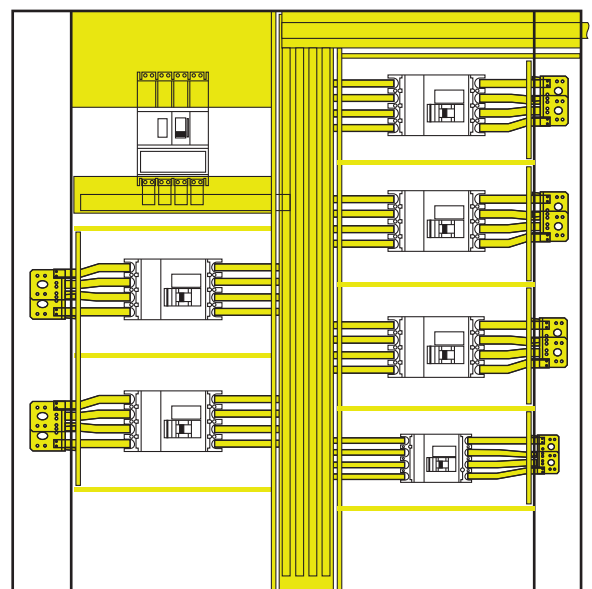
Terminals for external conductors separated from the busbars. The functional units are separated from one another and from the busbars. The terminals for external conductors are separated from the functional units but not from one another.

Bitoron offers form 3b separation:

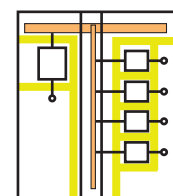
In addition to form 2 partitioning, add:

- horizontal barriers

In-duct connection assemblies can be used to separate the downstream terminals of the device from the functional unit.



Form 3a



Form 3b

## Definition of form 4

Separation of busbars from the functional units and separation of all functional units from one another, including the terminals for external conductors which are an integral part of the functional unit.

- protection against contact with live parts limitation of the faults between each of the functional units (propagation of electrical arcs, etc.)

### Two types of form 4 separation as specified by standard IEC 61439

#### ■ form 4a:

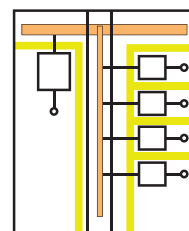
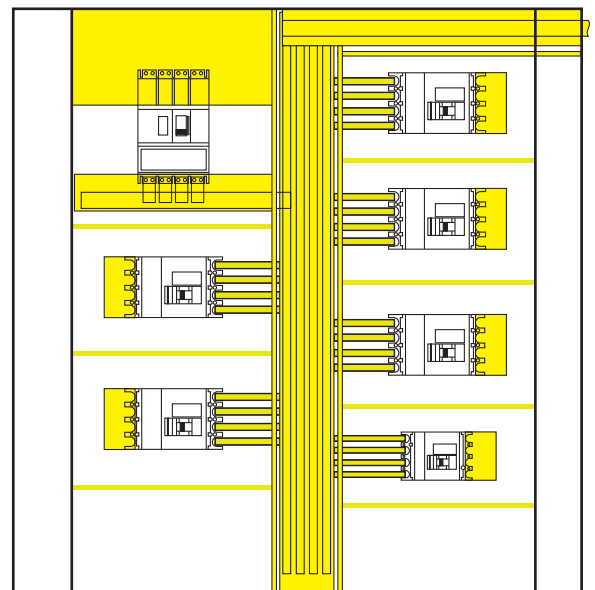
Terminals for external conductors in the same compartment as the associated functional units

#### ■ form 4b:

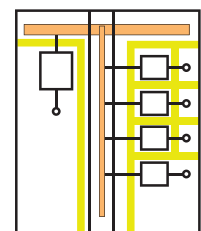
Terminals for external conductors in the same compartment as the associated functional units, but in protected spaces or separate closed compartments.

Bitoron-600 offers form 4b separation:

In addition to form 2 partitioning and horizontal barriers, add downstream terminal shields to outgoing devices.



Form 4a



Form 4b

After years of continuous Research, Development and Testing, **ADEX R & D team** has developed and validated quality performance of these range of products.



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