LMZ

ELEKTROMEKANİK









INDEX

About Us

A Low Voltage Panels

B Medium Voltage Switchgears

C Kiosks Type Substations

D Mobile Substations

E Resistors

F Transformers

ABOUT US



About Us

LMZ, was establish in 2009 to provide services to customers with trading ethics and principled approach leaning on 30 years of industry know-how, combining with experience in manufacturing and foreign trade.

Trusting the engineering staff with experience of being Turkey's first local Metal Enclosed Switchgear and Mobile Substation manufacturer as well as the design and manufacturing, LMZ provides customers in many countries with;

- Equipment needed in the generation, transmission and distribution of energy,
- Proper design and manufacture of mobile and fixed stations to meet the customer requirements,
- LV and MV switchgears and panels,
- Distribution and Power Transformers,
- Energy Distribution and Transmission projects contracting,

With its current structure, LMZ is achieving a combination of project design, material supply and contracting services.

LMZ aims to become a company that can resolve all the demands of its customers with a single point of service.

Using the strength gained by blending the manufacturer and exporter identities combined with the concept of customer-focused service and solutions, LMZ succeeds to be a reliable and preferred brand working around the world in 4 continents.

Our Mission

To find proper solutions by analyzing customer demands in the most accurate way in the light of experiences gained and to be gained in the electricity and energy sector and export quality products produced in Turkey as part of these solutions and contribute national economy by supporting manufacturers.

Our Vision

To make LMZ a world brand with successful projects to be realized and with high level customer satisfaction with the power of Turkish Electromechanic Industry.

LOW VOLTAGE
PANELS

SCHNIEDER SOLUTIONS

ABB SOLUTIONS

DISTRIBUTION PANELS

CONTROL, PROTECTION AND MIMIC PANELS



A. LOW VOLTAGE PANELS

LMZ find proper solution by analyzing customer demands and budgeds accordance with aiming to ensure customer satisfaction with using Schneider, Abb and Local partners products.

- Main distribution boards
- Sub main distribution boards
- Final distribution boards
- Starters control panels
- Motor control centres
- Automatic transfer switches
- Industrial plant control panels
- Building management systems panels
- Plc based controls
- Synchronizing control panels
- Feeder pillars
- Street lighting control panels
- Capacitor banks
- Capacitor banks with harmonic filters
- Active filters
- Meter cabinets
- Grp panels
- It panels
- Security panels
- Soft starters panels
- Variable frequency drives (vfd) panels
- Weather proof isolators
- High current disconnector panels
- Dc distribution panels
- Mosaic mimic panels

A.1. SCHNIEDER SOLUTIONS

With The Prisma Plus G system, Schneider Electric propes high-performance technical solutions to produce low voltage electrical distribution switchboards up to 630 A, in tertiary and industrial buildings. From the simplest through to the most sophisticated, these solutions, both quick, openended and tailored to meet customers' needs, are designed with a strict eye to detail to ensure a Professional result. Prisma Plus solutions conform to the specifi cations of standard IEC 60439-1: temperature rise control dielectric properties short-circuit withstand protection circuit efficiency clearances and creepage distances mechanical operation IP withstand. Installation, distribution and prefabricated connection systems have passed all tests successfully in the most restricting confi gurations. Simple like Prisma Production of the Prisma Plus switchboards follows the wiring diagram step by step. Each feeder or group of feeders has a mounting plate/front plate functional assembly allowing optimised and safe installation of devices.

The power circuit and the connections of the switchboard can be produced using prefabricated and tested solutions. Enclosure size is determined simply according to the switchgear installed, the connection method and positioning and the required free rows. Prisma Plus G System floor standing and wall mounted enclosures: open-ended switchboards suited to all functions

A.2. ABB SOLUTIONS

ArTu Main Distribution Boards ABB proposes three series of switchgear with different characteristics thought up to make it possible to select the most suitable switchgear for the installation requirements. Different sizes for optimal use of the spaces available.

Great savings in storage space is ensured by the rapid assembly kit containing so few pieces that skilled personnel is not required. IP degrees of protection for all types of application up IP65 - the only switchgear to reach such a high-value. Extremely sturdy and fl exible, it is made for plants up to 4000A.





ArTu L. Up to 800A you have a series of both wallmounted and fl oor-mounted switchgear available, able to ensure a high standard of quality along with maximum simplicity of selection and assembly.

ArTu M. Maximum protection up to 630A. The ArTu M series switchgear is ideal for terminal wall-mounted switchgear with modular circuit breakers and fl oor-mounted secondary distribution switchgear with moulded-case circuit-breakers up to 630A.

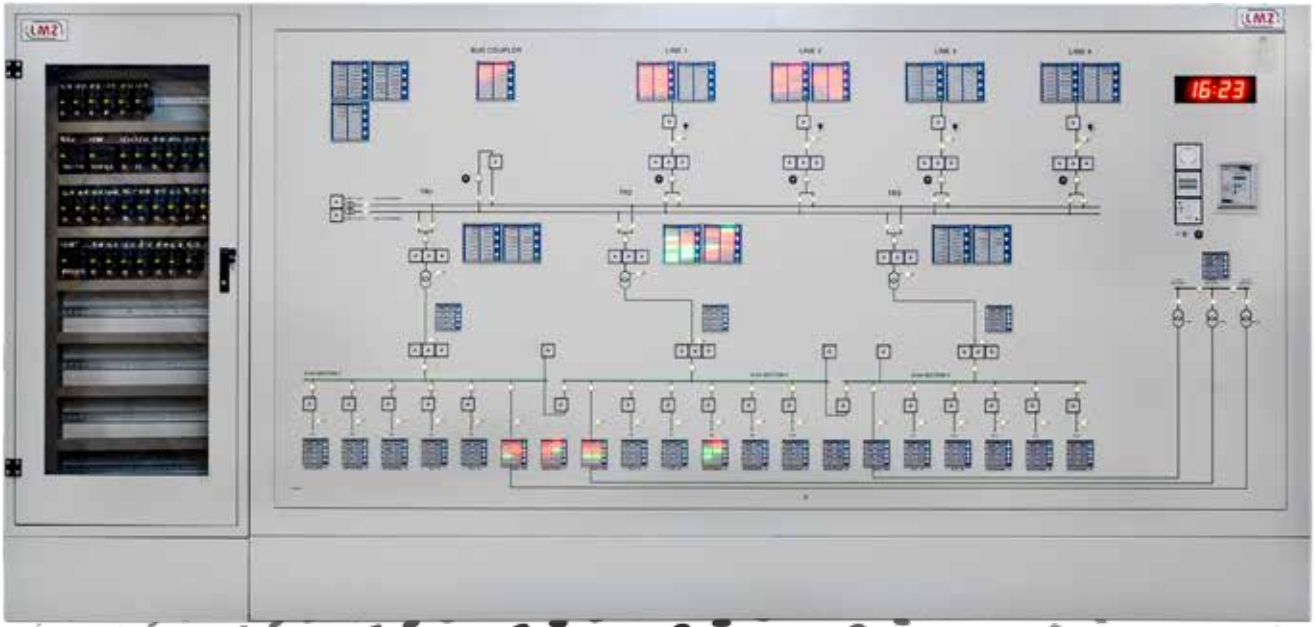
Many versions are available, for wall-mounted installation with depths of 150 and 200mm and for floor-mounted installation, with a depth of 250mm. The degree of protection is at top market levels, reaching up to IP65, thanks to an innovative design and advanced construction systems.

A.3. DISTRIBUTION PANELS

The internal and external LV distribution panels which are designed according to domestic and foreign projects, are designed and manufactured with bolt connection or welding as a modular board complying with project values. The switchgear components to be used inside the box type switchgears are selected according to the demands of the customer. The surface coating is performed with hot dip galvanize, electro-galvanized, electrostatic powder coat or industrial coats according to, again, the demands of the customer.

A.4. CONTROL, PROTECTION AND MIMIC PANELS

They are used as control, protection and control unit in industrial facilities. The operation of the system is watched visually via mimic diagram and it provides remote control possibility in case of necessity. The system can be completely controlled from a single centre with PLC and SCADA programs. It is used to move the protection relays protecting the LV and MV switchgear systems, warning and signal of the measurement instruments from switchgear to another division for the control and control. The measurement and protection devices forming the system define the system by using mimic diagrams and the user can control and control the flows through the feeders without going to the feeders. In addition to the manual products in mimic panels, the local solutions are also produced.



MEDIUM VOLTAGE SWITCHGEARS

LME SERIES METAL ENCLOSED SWITCHGEARS

LMC SERIES METAL CLAD SWITCHGEARS

GIS SERIES GAS INSULATED SWITCHGEARS



B.1. LME series Metal Enclosed Switchgears

LME series Metal Enclosed Switchgears are air insulated switching, control and measuring equipment between 1 kV and 40.5 kV, manufactured in conformity with IEC 62271-200 with higher mechanical and electrical endurance to be used in indoor facilities providing the continuous operations during the failures and maintenance.

The Metal Enclosed Switchgears are defined with below main characteristics;

- Air insulated,
- LSC 2A Loss of Service continuity,
- PI Partition Class,
- AFL Internal Arc Classfication,
- 3 accessible compartments,



B.1.1. Compartments and Content;

LME series Metal Enclosed Switchgears contain 3 segregated compartments.

a - Low Voltage Compartment

b - Busbar Compartment

c - Switching Equipment and Cable Compartment

a-Low Voltage Compartment

This compartment contains all secondary circuits for measurement, protection, control, monitoring, communication and other associated systems

b-Busbar Compartment

This is the compartment where the energy is connected from main busbar system to the switchgear or from switchgear to the main busbar system. This compartment contains electrolytic copper busbars in compliance with the rated current and post insulators carrying the main busbars.

c-Switching Equipment and Cable Compartment

It is the compartment where the energy is connected to the substation or the energy is received from the substation.

The components which can be included in this compartment are given below.

- Switching equipment
- Current transformers
- Voltage transformers
- Surge arresters

- Earthing Switch
- Capacitive voltage divider
- Cable connection couplings

  The switching component to be used in this compartment is selected according to the specifications of the circuit feeding or to be fed from below alternatives or as a disconnector + breaker/contactor compound,
- SF6 Gas circuit breaker
- vacuum circuit breaker
- SF6 Gas insulated Load Break Switch
- SF6 Gas Insulated Disconnector
- Rotary Disconnector
- Vacuum Contactor

B.1.2. Operational Safety

LME series Metal Enclosed Switchgears are produced in compliance with the interlocks in the IEC62271-200 and interlocks specific to the station for the safety of the operation.

There are mechanical interlocks at present for the operational safety, as below.

- The LBS and LBS with fuse can not be intervened if the switchgear door is open.
- The LBS and LBS with fuse con not be intervened when the earthing switch is closed.
- The disconnectors in the same circuit with the breaker cannot be intervened if the switchgear door is open and the breaker is closed.
- The disconnectors in the same circuit with the breakers cannot be intervened when the earthing switch is closed.
- The Earthing switch cannot be intervened while the disconnector is closed.

B.1.3. Related Standards

LME series switchgears are manufactured in conformity with below standards.

- IEC 62271-1 : General articles relating to High Voltage Switchgears
- IEC 62271-200 : Metal Enclosed Switchgears (1 - 52 kVac)
- IEC 62271-100 : Circuit Breakers (1 - 52 kVac)
- IEC 62271-102 : Main Circuit and grounding Disconnectors
- IEC 62271-105 : AC Switch and Fuse combinations
- IEC 60044-1 : Current Transformers
- IEC 60044-2 : Voltage Transformers
- IEC 60273 : Insulators
- IEC 60051 : Measuring Devices
- IEC 60255 : Secondary Protection relays



B.1.4. Application Areas:

LME series metal enclosed switchgears are produced for the fields of applications where the nominal operation current to 1250 Ampere and the nominal short circuit current to 25 kiloAmpere are present, and the fields of application are given below.

- Energy Distribution Centers
- Hydroelectric and Wind Energy Applications
- Solar Energy Plants
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Auto Industry
- Petroleum and Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipe lines
- Shipyards
- Emergency Situation and Stand-by Power Facilities
- Ore Mines
- Railway Substations



B.1.5. Advantages:

- LSC2A service continuity
- Grounded metal separation between compartments
- Maximum human safety with AFL internal arc testing feature
- Reinforced with steel structure having 2 mm thickness
- Safe electrical and mechanical Interlock systems do not allow to operational faults
- SF6 gas insulated Circuit breaker allows fast and easy servicing
- Grounding system with ensured continuity
- Quick Easy Setup
- Modular design, which allows extension easily
- Tested short time withstand current up to 25 kA / 1 s.
- Interactive mimic diagram
- Proven reliability with unique design
- Low maintenance cost
- Easy and safety operation
- After sale service and spare parts availability
- Easily transport and storage

B.1.6 TECHNICAL SPECIFICATIONS

Descriptions		LME 3,6	LME 7,2	LME 1 12	LME 17,5	LME 24	LME 36	LME 40,5
Rated Voltage (rms)	kV	3,6	7,2	12	17,5	24	36	40,5
Power frequency withstand voltage 50 Hz, 1 min (rms) between phases and phase-ground	kV	10	20	28	38	50	70	85
Lightning impulse withstand voltage 1.2/50ms (peak) between phases and phase-ground	kV	40	60	75	95	125	170	185
Rated frequency	Hz	50 - 60						
Rated (rms) current of switchgears with								
Busbars	A	630.... 1250			630.... 1250		630.... 1250	
C/B and Disconnector	A	630.... 1250			630.... 1250		630.... 1250	
Load break switches	A	630			630		630	
Vacuum Contactors (inductive switching)	A	400			400		-	
Vacuum Contactors (capacitive switching)	A	250			200		-	
Rated short time withstand (rms) current with								
C/B and Disconnectors	kA	16 - 20 - 25			16 - 20 - 25		16 - 20 - 25	
Load break switches	kA	16 - 20			16 - 20		16 - 20	
Vacuum Contactors	kA	8			8		8	
Rated short time withstand (peak) current with								
C/B and Disconnectors	kA	40 - 50 - 63			40 - 50 - 63		40 - 50 - 63	
Load break switches	kA	40 - 50			40 - 50		40 - 50	
Vacuum Contactors	kA	20			20		20	
Short circuit withstand time	sn	1			1		1	
Internal Arc Failure								
Current	kA	16 - 2 0 - 25			16 - 2 0 - 25		16 - 2 0 - 25	
Duration	sn	1			1		1	
Earthing Switch								
Rated short circuit current making capacity	kA	16 - 20 - 25			16 - 20 - 25		16 - 20 - 25	
Rated short time withstand (peak) current	kA	40 - 50 - 63			40 - 50 - 63		40 - 50 - 63	
Rated short circuit withstand time	sn	1			1		1	
Switchgear Structure as per the								
loss of service continuity		LSC 2A						
internal arc classification		AFL						
partition class		PI						
Protection Class								
when doors are closed		IP40						
between compartments		IP20						
Color		RAL 9003 / 7035						
Standards complied		IEC 62271-200						

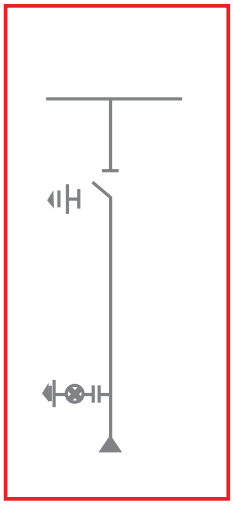
B.1.7. Switchgears Types:

Incoming/Outgoing Feeder with offload disconnector switch (DS):

It is the switchgear without measurement and protection system up to 1250 A rated current, 25 kA short circuit level up to 25 kA for using offload operation of energy in the substation as incoming or outgoing purpose.

It does not have onload operation.

- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X

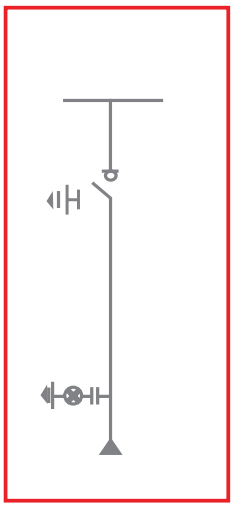


Incoming &Outgoing feeder with Load Break Switch (LBS):

It is the switchgear without measurement and protection system up to 630 A rated current, 20 kA short circuit current for the segregation of the power incoming to the power facility, energy outgoing from the facility or to divide the power within the facility. They are used as a cost-efficient alternative to the breaker switchgear

It has the opening and closing features on load.

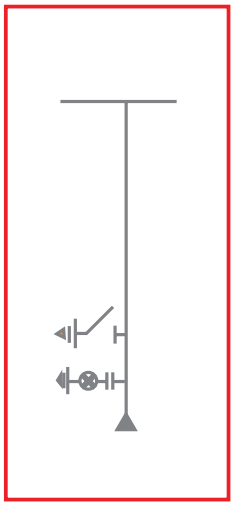
- Switching Under the Load : Applicable
- Maximum Nominal Current : 630 A
- Maximum Short Circuit Current : 20 kA
- Control and Protection Circuit : Control
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X



Cable Connection Feeder:

It is the switchgear without switching, measurement and protection system up to 1250 A rated current, 25 kA short circuit current for the direct receive of the energy on the main busbar to the cable or the power on the busbar to the main busbar.

- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Optional
- Number of Compartments : 2
- Number of Poles : 3
- Number of Positions :
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : No compartment
- Protection Class : IP 3X

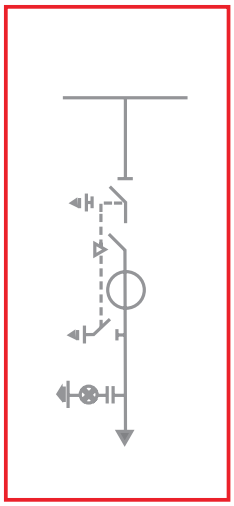


Incoming / Outgoing Feeder with Circuit Breaker:

It is the switchgear with protection system in its standard production up to 1250 A rated current, 25 kA short circuit current for using onload operation of energy in the substation as incoming or outgoing purpose.

It has the opening and closing features on load.

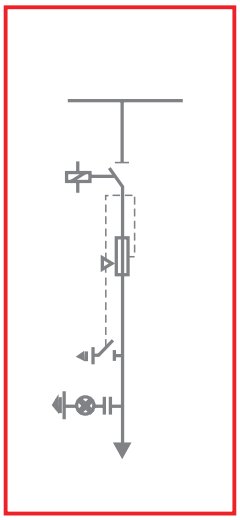
- Switching Under the Load : Applicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X



Outgoing Feeder with Vacuum Contactor:

It is the switchgear with protection system in the standard production up to 24 kV nominal voltage and 400 A rated current to be used for the feeding of the loads which require frequent switching. It is generaly used for feeding capacitor banks, reactors and electrical motors.

It has the opening and closing features on load.

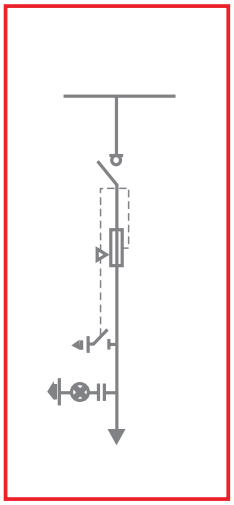


- Switching Under the Load : Applicable
- Maximum Nominal Current : 400 A
- Maximum Short Circuit Current :
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : Positions
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X

Outgoing Feeder with Fused Type Load Break Switch:

It is the switchgear having fuse protecting system in its standard production up to 630 A rated current, 20 kA short circuit current, and generally used in the switches and distribution transformer protection and switching of distribution transformers.

It has the opening and closing features on load.



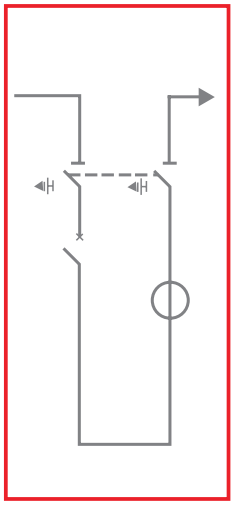
- Switching Under the Load : Applicable
- Maximum Nominal Current : 630 A
- Maximum Short Circuit Current : 20 kA
- Control and Protection Circuit : Control +Fuse Protection
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X

Bus Section And Riser Feeder With Circuit Breaker:

It is the switchgear with a protection system in its standard production up to 1250 A rated current, 25 kA short circuit current to be able to divide the busbar in the facility into two or unite two different busbars. It consists of the combination of the busbar dividing and raising switchgears.

It has the opening / closing feature with load.

- Switching Under the Load : Applicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X

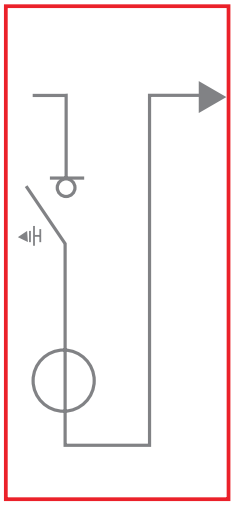


Bus section and Riser Feeder With Load Break Switch:

It is the switchgear without measurement and protection system in its standard production up to 630 A rated current, 20 kA short circuit current to divide the busbar in the facility into two or unite two different busbars.

It has the opening / closing feature with load.

- Switching Under the Load : Applicable
- Maximum Nominal Current : 630 A
- Maximum Short Circuit Current : 20 kA
- Control and Protection Circuit : Control
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X

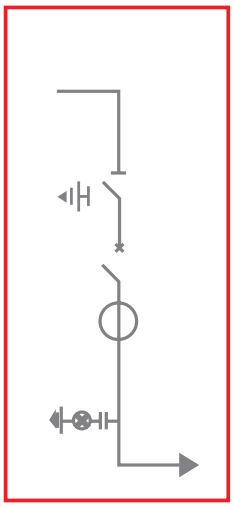


Bus Section Feeder with Circuit Breaker:

It is the switchgear that has a protection system in its standard production up to 1250 A rated current, 25 kA short circuit current to divide the busbar in the facility into two. It is used together with busbar raising unit.

It has the opening / closing feature with load.

- Switching Under the Load : Applicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X

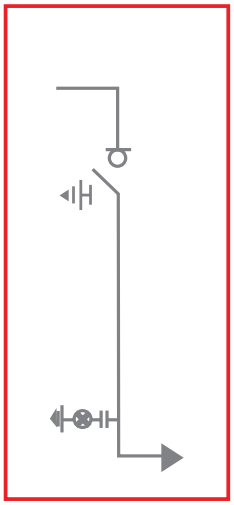


Bus Section Feeder with Load Break Switch:

It is the switchgear that is produced without measurement and protection system up to 630 A rated current, 20 kA short circuit current to divide the busbar in the facility into two. It is used together with busbar raising unit.

It has the opening / closing feature with load.

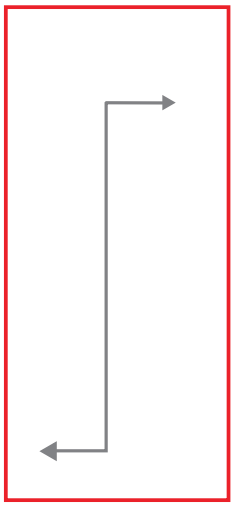
- Switching Under the Load : Applicable
- Maximum Nominal Current : 630 A
- Maximum Short Circuit Current : 20 kA
- Control and Protection Circuit : Control
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X



Bus Riser Feeder:

They are the switchgears without switching, measurement and protection systems in production for the connection of Bus section switchgear' busbars by rising up to other busbar system with rated current up to 1250 A and short circuit current up to 25 kA. They are used together with bus section feeders.

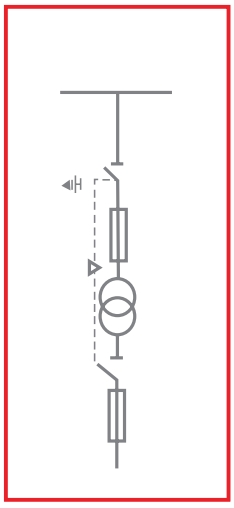
- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Optional
- Number of Compartments : 2
- Number of Poles : 3
- Number of Positions :
- Standard to be Complied : IEC62271-200
- Service Continuity : No Continuity
- Internal Arc Classification : AFL
- Compartment : No Compartments
- Protection Class : IP 3X



Voltage Transformer Feeder:

The switchgear can be produced up to 25 kA short circuit current to measure the busbar voltage in the power facility.

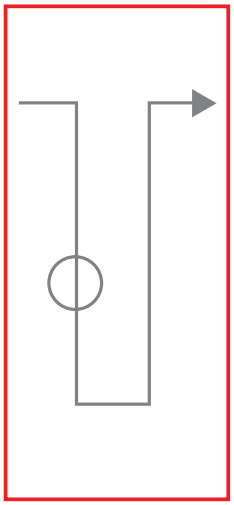
- Switching Under the Load : Inapplicable
- Maximum Nominal Current : Inapplicable
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Voltage Measurement
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X



Busbar Current Measurement Feeder:

It is the switchgear without switching and protection systems, up to 1250 A rated current, 25 kA short circuit current to measure the busbar current in the power facility.

- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Current Measurement
- Number of Compartments : 2
- Number of Poles : 3
- Number of Positions :
- Standard to be Complied : IEC62271-200
- Service Continuity : No Continuity
- Internal Arc Classification : AFL
- Compartment : No Compartments
- Protection Class : IP 3X

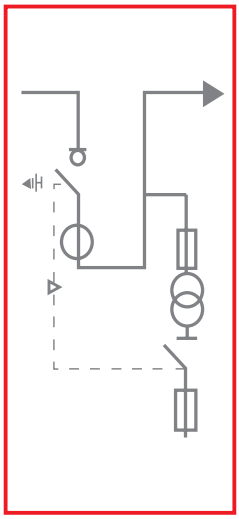


Customer Metering Feeder:

It is the switchgear without a protection system, up to 630 A rated current, 20 kA short circuit current to measure the busbar current and voltage in the power facility.

It has the opening / closing feature with load.

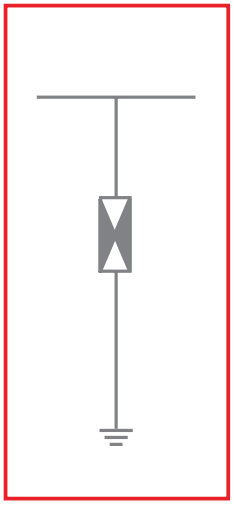
- Switching Under the Load : Applicable
- Maximum Nominal Current : 630 A
- Maximum Short Circuit Current : 20 kA
- Control and Protection Circuit : Control
- Measurement Circuit : Current + Voltage Measurement
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2A
- Internal Arc Classification : AFL
- Compartment : PI
- Protection Class : IP 3X



Surge Arresters Feeder:

They are the switchgears without switching, measurement and protection systems in production up to1250 A rated current, 25 kA short circuit current to protect the facility and transfer the impact voltages and temporary over voltages to the ground safely.

- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 1250 A
- Maximum Short Circuit Current : 25 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Inapplicable
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions :
- Standard to be Complied : IEC62271-200
- Service Continuity : No Continuity
- Internal Arc Classification : AFL
- Compartment : No Compartment
- Protection Class : IP 3X



B.1.8. Switchgear Dimension Table

40,5 kV Depth : 1500 mm Height : 2300 mm			36 kV Depth : 1400 mm Height : 2250 mm				17,5 - 24 kV Depth : 900 mm Height : 2000 mm				3,6 - 12 kV Depth : 900 mm Height : 2000 mm			
2200	1200	1000	1750	1150	1000	750	1250	1000	750	500	1125	750	375	Width (mm)
		✓				✓				✓			✓	Incoming Feeder with offload disconnector switch (DS)
Not produced						✓				✓			✓	Incoming Feeder with Load Break Switch (LBS)
		✓				✓				✓			✓	Cable Connection Feeder
	✓				✓				✓			✓		Incoming / Outgoing Feeder with Circuit Breaker
Not produced			Not produced						✓			✓		Outgoing Feeder with Vacuum Contactor
Not produced						✓				✓			✓	Outgoing Feeder with Fused Type Load Break Switch
✓			✓				✓				✓			Bus Section And Riser Feeder
Not produced				✓				✓				✓		Bus section and Riser Feeder with Load Break Switch
Not produced						✓				✓			✓	Bus Section Feeder with Load Break Switch
	✓				✓				✓			✓		Bus Section Feeder with Circuit Breaker
		✓				✓				✓			✓	Bus Riser Feeder
		✓				✓				✓			✓	Voltage Transformer Feeder
	✓				✓				✓			✓		Busbar Current Measurement Feeder
Not produced				✓				✓				✓		Customer Metering Feeder
		✓				✓				✓			✓	Surge Arresters Feeder

B.2. LMC series Metal Clad Switchgears

Metal Clad Switchgears are switching and control cabinets manufactured between 1 kV ... 40.5 kV in conformity with IEC 62271-200 standards. LMC series Metal Clad Switchgears are defined with following fetures acc to IEC 62271-200.

- Air insulated
- LSC 2B loss of service continuity
- PM partition class
- AFLR Internal arc classifications
- 4 accessible compartments



LMC series Metal Clad Switchgears consist of 4 compartments which are completely segregated from each other by grounded metal compartments.

a - Low Voltage Compartment

b - Busbar Compartment

c - Switching Equipments Compartment

d - Cable Compartment

a- Low Voltage Compartment

It is the command, control and measurement section of the switchgear. This compartment contains all secondary circuits for control, measurement, protection, monitoring, communication and other associated systems measurement devices, protection relays, terminal connections, communication devices and other protection and control devices.

b- Busbar Compartment

It is the compartment where the energy is connected from main busbar system to the switchgear or vice versa. In this compartment, there are post insulators bearing the main busbars and electrolyte copper busbars complying with the rated current.



c-Switching Equipments Compartment

It is the part where the switching components or voltage transformers are in.

The switching compartment consists of following units.

- Switching Equipments
- Voltage transformer
- Earthing truck

The switchgear product to be used in this compartment is selected as one of below alternatives according to the specifications of the circuit which it feeds or is to be fed by it.

- SF6 circuit breaker
- Vacuum circuit breaker
- Disconnector

d- Cable Compartment

It is the compartment where the energy is connected to the station or the energy is received from the station.

Followings equipment is located inside Cable compartments;

- Current transformer
- Voltage transformer
- Surge arrestor
- Earthing switch
- Capacitive voltage divider
- Cable gland and connection fixtures

B.2.2. Operational Safety :

LMC series Metal Clad Switchgears are produced fully in conformity with the interlocks in IEC62271-200 and special substation interlocks in order to enable the highest level of operational safety.

There are electrical and mechanical interlocks at present to enable the safe operation and they are as below.

- The withdrawal or engagement of the C/B is not possible during the C/B is “On” position
- The operation of the C/B is not possible unless it is in service and test position
- It is not possible to open the switching compartment door when it is in service position
- It is not possible to close the C/B when switching compartment door is open
- Closing of earthing switch is not possible if circuit breaker truck is in service position
- The operation of the C/B is not possible when earthing switch is closed.



B.2.3. Standards Complied:

LMC series Metal Clad Switchgears are manufactured in conforming to following standards:

- IEC 62271-1 : General articles relating to High Voltage Switchgears
- IEC 62271-200 : Metal Enclosed Switchgears (1 - 52 kVac]
- IEC 62271-100 : Circuit Breakers (1 - 52 kVac]
- IEC 62271-102 : Main Circuit and grounding Disconnectors
- IEC 62271-105 : AC Switch and Fuse Combinations
- IEC 60044-1 : Current Transformers
- IEC 60044-2 : Voltage Transformers
- IEC 60273 : Insulators
- IEC 60051 : Measuring Devices
- IEC 60255 : Secondary Protection relays.

B.2.4. Application Areas:

LMC series Metal Clad Switchgears are produced for the field of applications with nominal operation current up to 4000 Ampere and nominal short circuit current up to 50 kA and the field of applications are given below.

- Energy Transmission and Distribution Centers
- Hydroelectric Power Plants
- Solar Energy Plants
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Auto Industry
- Petroleum and Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipelines
- Shipyards
- Emergency Situation and Stand-by Power Plants
- Ore Mines
- Railway Substations

B.2.5. Advantages:

- LSC2B Maximum Service Continuity
- Earthed metal partitions between compartments
- Maximum human safety with AFLR internal arc testing feature
- Safety electrical and mechanical Interlocks doesn't allow to operational faults
- Withdrawable type Vacuum / SF6 Circuit breaker for fast and easy servicing
- Earthing system, continuity ensured
- Modular compact design, allows any future expansion
- Tested short time withstand currentat 31.5 kA / 3 s.
- Long operational life - 10.000 switching
- Interactive mimic diagram
- Proven reliability with unique design
- Low maintenance cost
- Easy and safety operation
- After sale service and spare parts availability

B.2.6. Technical Specifications:

Descriptions		LMC 3,6	LMC 7,2	LMC 12	LMC 17,5	LMC 24	LMC 36	LMC 40,5
Rated Voltage (rms)	kV	3,6	7,2	12	17,5	24	36	40,5
Power frequency withstand Voltage 50 Hz, 1 min (rms) between phases and phase-ground	kV	10	20	28	38	50	70	85
Lightning impulse withstand Voltage 1.2/50 ms (peak) between phases and phase - ground	kV	40	60	75	95	125	170	185
Rated frequency	Hz	50 - 60						
Rated (rms) current of switchgears with Busbars (with natural ventilation) (forced ventilation) C/B and Disconnector (with natural ventilation) (forced ventilation) Load break switches Vacuum Contactors (inductive switching) Vacuum Contactors (capacitive switching)	 A A A A A A A	 630.... 3150 5000 630....3150 5000 630 400 250			 630.... 3150 5000 630.... 3150 5000 630 800 200		 630.... 3150 5000 630.... 3150 5000 630 - -	
Rated short time withstand (rms) current with C/B and Disconnectors Load break switches Vacuum Contactors Rated short time withstand (peak) current with C/B and Disconnectors Load break switches Vacuum Contactors	 kA kA kA kA kA kA	 16... 50 16 - 20 8 40 ... 125 40 - 50 20			 16... 50 16 - 20 8 40 ... 125 40 - 50 20		 16... 50 16 - 20 - 40 ... 125 40 - 50 -	
Internal Arc withstand Current Duration	 kA sn	 16 .... 31.5 1 veya 3			 16 .... 31.5 1 veya 3		 16 .... 31.5 1 veya 3	
Earthing Disconnector Rated short time withstand current Duration (up to 31.5 kA) (above 31.5 kA)	 kA sn sn	 16... 50 3 1			 16... 50 3 1		 16... 50 3 1	
Switchgear Structure as per the loss of service continuity internal arc classification partition class		LSC 2B AFLR PM						
Protection Class when doors are closed - standard optional between compartments		IP40 IP42 IP20						
Color		RAL 9003 / 7035						
Standards complied		IEC 62271-200						

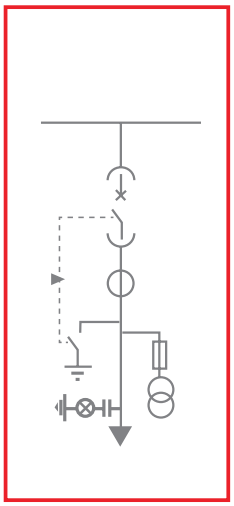
Note: Full type tests of LMC switchgears up to 31.5 kA are performed at CESI accredited laboratories in Italy.

B.2.7. Incoming/Outgoing Feeder with Circuit Breaker:

It is the switchgear with protection system in its standard production and able to produce rated current up to 4000 A and short circuit current up to 50 kA for using onload operation of energy in the substation as incoming or outgoing purpose.

Switching Under the Load : Applicable

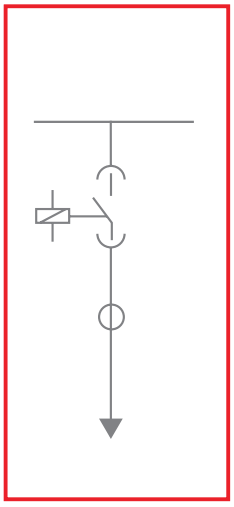
- Maximum Nominal Current : 4000 A
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 4
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2B
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



Outgoing Feeder with Vacuum Contactor:

It is the switchgear with protection system in the standard production up to 24 kV nominal voltage and 400 A rated current to be used for the feeding of the loads which require frequent switching. It is generaly used for feeding capacitor banks, reactors and electrical motors.

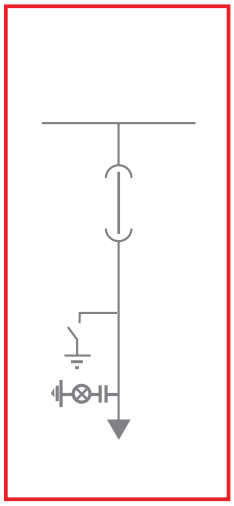
- Switching Under the Load : Applicable
- Maximum Nominal Current : 400 A
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 4
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2B
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



Cable Connection Switchgear:

It is the switchgear without switching, measurement and protection system up to 4000 A rated current, 50 kA short circuit current for the direct receive of the energy on the main busbar to cable or the energy on the busbar to main busbar.

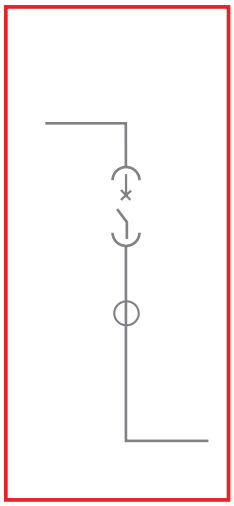
- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 4000 A
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Optional
- Number of Compartments : 2
- Number of Poles : 3
- Number of Positions :
- Standard to be Complied : IEC62271-200
- Service Continuity : No Continuity
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



Bus Section Feeder with Circuit Breaker:

It is the switchgear with a protection system in its standard production up to 4000 A rated current, 50 kA short circuit current to segregate the energy busbar in the facility into two. It is used together with busbar raising unit.

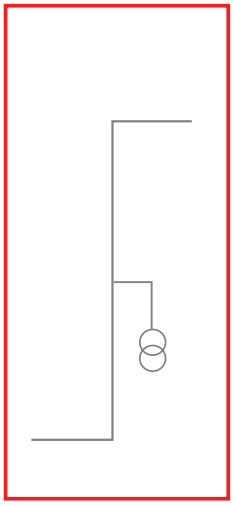
- Switching Under the Load : Applicable
- Maximum Nominal Current : 4000 A
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Control + Protection
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2B
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



Bus Rıser Feeder:

They are the switchgears without switching, measurement and protection systems in production up to 4000 A rated current, 50 kA short circuit current to bring the busbar to be segregated by the busbar separating unit to other busbar level and to be used to connect these two busbars. They are used together with Bus Section Feeder.

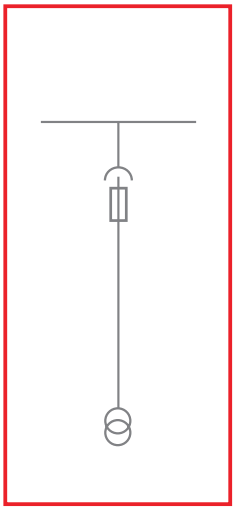
- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 4000 A
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Optional
- Number of Compartments : 3
- Number of Poles : 3
- Number of Positions :
- Standard to be Complied : IEC62271-200
- Service Continuity : No Continuity
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



Voltage Transformer Feeder:

It is possibly produced up to 50 kA short circuit current to measure the busbar voltage in the power facility.

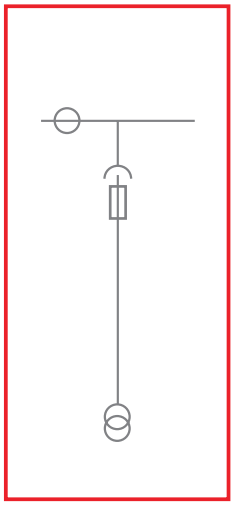
- Switching Under the Load : Inapplicable
- Maximum Nominal Current : Inapplicable
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Voltage Measurement
- Number of Compartments : 4
- Number of Poles : 3
- Number of Positions : 3
- Standard to be Complied : IEC62271-200
- Service Continuity : LSC 2B
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



Busbar Current – Voltage Measurement Switchgear:

It is the switchgear without protection system in its production and can be produced up to 4000 A rated current and 50 kA short circuit current to measure the current and voltage of the busbar in the power facility.

- Switching Under the Load : Inapplicable
- Maximum Nominal Current : 4000 A
- Maximum Short Circuit Current : 50 kA
- Control and Protection Circuit : Inapplicable
- Measurement Circuit : Current + Voltage Measurement
- Number of Compartments : 4
- Number of Poles : 3
- Number of Positions : 2
- Standard to be Complied : IEC62271-200
- Service Continuity : No Continuity
- Internal Arc Classification : AFLR
- Compartment : PM
- Protection Class : IP 4X



B.3. GIS series Gas Insulated Switchgear:



GIS series Gas Insulated Switchgears are produced in conformity with the IEC62271-200 standard from 1 kV to 40.5 kV, having high mechanical and electrical strength where the operator safety is enabled in this Medium Voltage switching, control and measurement switchgears.

The gas insulated switchgears are defined with below characteristics:

- SF6 Gas Insulation Class,
- PM Class Compartments,
- AFL Internal Arc Class,
- Compact and Small Structure.

B.3.1. Compartments and Contents;

All switchgear and moving parts of the GIS series Gas Insulated Switchgears are kept in a single stainless steel compartment. Additionally, the low voltage compartment may be added to the switchgear.

Low Voltage Compartment
It is the command, control and measurement part of the switchgear. In this part, there are measurement devices, protection relays, terminal connections, communication devices and other command equipments.

B.3.2. Operational Safety

GIS series Gas Insulated Switchgears are manufactured fully in compliance with the interlocks in the IEC62271-200 in order to enable the operational safety.

As the complete system is in a closed steel tank, the operational safety is provided at a higher level. There are mechanical interlocks for the healthy operation of the safe system, as below;

- While the door of the switchgear providing access to the cable and fuse is open, the switchgear cannot be energised.
- While the Earthing Switch is close, the Earthing Switch of the switchgear cannot be closed.
- While the Earthing Switch is close, the switchgear cannot be energised.
- The switchgear with the Earthing Switch is on, the door providing the cable and fuse access of the switchgear cannot be opened.

B.3.3. Standards Complied:

- GIS series switchgears are in compliance with below standards.
- IEC 62271-1 : General Articles Relating to High Voltage Switchgears
- IEC 62271-200 : Metal Enclosed Switchgears (1 – 52 kVac)
- IEC 62271-100 : Breakers (1-52 kVac)
- IEC 62271-102 : Main circuit and Grounding disconnectors
- IEC 62271-105 : AC Switch and Fuse Combinations
- IEC 60044-1 : Current Transformers
- IEC 60044-2 : Voltage Transformers
- IEC 60273 : Insulators
- IEC 60051 : Measuring Instruments
- IEC 60255 : Secondary Protection Relays



B.3.4. Application Areas:

GIS series Gas Insulated Switchgears are produced in two types as Standard and Plus. The nominal operation current for standard type can be up to 630 Ampere and 2500 Ampere for plus type, and the short circuit current flow can be up to 25 kA for standard type and 31,5 kA for plus type with below application areas.

- Energy Transmission and Distribution Centers
- Hydroelectric Power Plants
- Solar Energy Plants
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Auto Industry
- Petroleum and Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipelines
- Shipyards
- Emergency Situation and Stand-by Power Plants
- Ore Mines
- Railway Substations

B.3.5.Advantages:

- Ability to work without being affected from humidity, dust and dirt
- Grounded metal cladding among compartments
- AFL internal arc test feature for human safety in standard type
- Strong structure in steel tank
- SF6 gas insulation providing small and compact structure
- Safe electrical and mechanical interlock system eliminating the operational failures
- Drawable structure for easy and quick service
- Continues grounding system
- Easy and quick installation
- Interactive mimic diagram
- Superior design with proven reliability
- Easy and safe operation
- After sale service and spare part supplies
- Easy transportation and storage
- Free from maintenance cost



B.3.6. Technical Specifications

B.3.6.1 Standard Type:

Main characteristics

Mechanical and Electrical Characteristics	U.M.							
	kV	7,2	12	12*	17,5	24	36	40,5*
Altitude **IEC 62271-1**	m	<1000 (4)						
Ambient air temperature **IEC 62271-1**	°C	-25 ÷55 (3)						
Relative humidity	%	95						
Insulation Rated Voltage	kV	7,2	12	12	17,5	24	36	40,5
Rated Voltage	kV	7,2	12	12	17,5	24	36	40,5
Lightning impulse withstand voltage between phases and towards the ground	kV	60	75	95	95	125	170	185
Lightning impulse withstand voltage across the isolating distance	kV	70	85	110	110	145	195	210
Power frequency withstand voltage between the phases	kV	20	28	42	38	50	70	95
Power frequency withstand voltage across the isolating distance	kV	23	32	48	45	60	80	110
Rated Frequency	Hz	50-60						
Rated current	A	630 - 1250 (3)						
Rated short time withstand current (L -U1 module) I_k (5)	kA	16-20-25	16-20-21		12.5-16-20			
Rated short time withstand current (F module) I_k (5)	kA	16-20-25	16-20-21		12.5-16-20			
Rated short time withstand current (C -T -U2 module) Ik (5)	kA	16-20-25	16-20-21		12.5-16-20			
Rated peak withstand current I_p (making capacity)	kA	2,5 x I_k						
Rated duration of short circuit t_k	s	3 (1)			3			
Degree of protection on front face	IP	3X						
Degree of protection on electrical MV circuits	IP	67						
Mechanical operation **Switch disconnector IEC 60265-1**		1.000 operations / Class M1						
Electrical operation **Switch disconnector IEC 60265-1**		100 breaks at In p.f.=0,7 / Class E3						
Mechanical operation **Earthing switch IEC 60271-102**		1.000 operations / Class M1						
Electrical operation **Earthing switch IEC 60271-102**		making capacity 5 / Class E2						
Mechanical operation **Circuit breaker IEC 62271-100 C module**		M2 / 10,000 operations						
Electrical operation **Circuit breaker IEC 62271-100 C module**		E2						
Mechanical operation **Circuit breaker IEC 62271-100 T module**		M1 / 2000 operations						
Electrical operation **Circuit breaker IEC 62271-100 T module**		E1						
Rated operating sequence **Circuit breaker IEC 62271-100**		O - 0,3s - CO - 3 min - CO						
Internal arc withstand current	kA x s	16kA 1s (2)						
Making & breaking on fuse-switch **F** module	kA rms	25	25	25	25	20	20	20
Breaking at rated transfer current $I_{transfer}$ **F** module	A	2100	1800	1800	1600	1400	840	840
Mainly active load breaking current **Switch disconnector IEC 60265-1**	A	630						
Close loop breaking current **Switch disconnector IEC 60265-1**	A	630						
No load transformer breaking current **Switch disconnector IEC 60265-1**	A	16						
Cable charging breaking current **Switch disconnector IEC 60265-1**	A	32						
Line charging breaking current **Switch disconnector IEC 60265-1**	A	32						
Earth fault breaking current **Switch disconnector IEC 60265-1**	A	57						

(1) For Ik25 kA Maximum short circuit duration time 1s
(2) 20kA 1s on request
(3) Rated current is referred to 40°C ambient temperature.
For different values contact SEL
(4) For different values contact SEL
*For Asian market

B.3.6.2 Plus Type:

Main characteristics

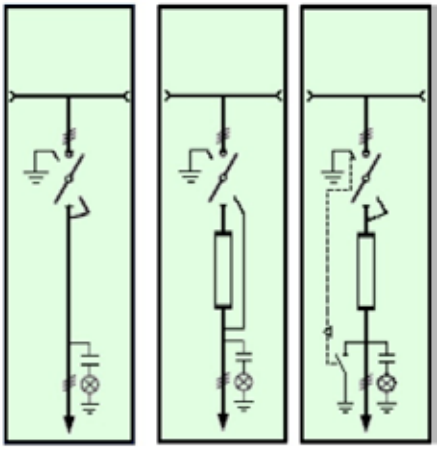
Mechanical and Electrical Characteristics	U.M.						
	kV	7,2	12	12(1)	17,5	24	36
Altitude **IEC 62271 - 1**	m	<1000 (5)					
Ambient air temperature **IEC 62271 - 1**	°C	-25 ÷55 (2)					
Relative humidity	%	95					
Insulation Rated Voltage	kV	7,2	12	12	17,5	24	36
Rated Voltage	kV	7,2	12	12	17,5	24	36
Lightning impulse withstand voltage between phases and towards the ground	kV	60	75	95	95	125	170
Lightning impulse withstand voltage across the isolating distance	kV	70	85	110	110	145	195
Power frequency withstand voltage between the phases	kV	20	28	42	38	50	70
Power frequency withstand voltage across the isolating distance	kV	23	32	48	45	60	80
Rated Frequency	Hz	50-60					
Rated current	A	1250-2500			1250 - 2000		
Rated short time withstand current I_k	kA	25 / 31.5 (7)					
Rated peak withstand current I_p (making capacity)	kA	2,5 x I_k (4)					
Rated duration of short circuit t_k	s	3 / 1 (7)					
Degree of protection on front face	IP	3X(3)					
Degree of protection on electrical MV circuits	IP	67					
Mechanical operation **Earthing switch IEC 62271-102**		1.000 operations / Class M1					
Electrical operation **Earthing switch IEC 62271-102**		making capacity 5 / Class E2 (6)					
Mechanical operation **Circuit breaker IEC 62271-100 CB module**		M1 (2000 operation) - M2 / 10,000 operations					
Electrical operation **Circuit breaker IEC 62271-100 CB module**		Class E2 (1)					
Making & Breaking on fuse switch **TF / FM module**	kA rms	25	25	25	25	25	20
Breaking at rated transfert current ($I_{tranfer}$) **TF / FM module**	A	2100	1800	1800	1600	1400	20
Rated operating sequence **Circuit breaker IEC 62271-100**		O - 0,3s - CO - 15s - CO					
Internal arc withstand current (kA - 1s)	kA	25					

(1) For Asian market
(2) For temperature > of 40°C contact SEL for Admissible current value
(3) IP 4X on request
(4) For earthing switch by closing Circuit-breaker
(5) Only for air insulated unit if any
(6) By closing Circuit-breaker
(7) 25kA 3sec. - 31.5kA 1sec.

B.3.7. Switchgear Types:

B.3.7.1 Standard Switchgear Types:

L Type F Type



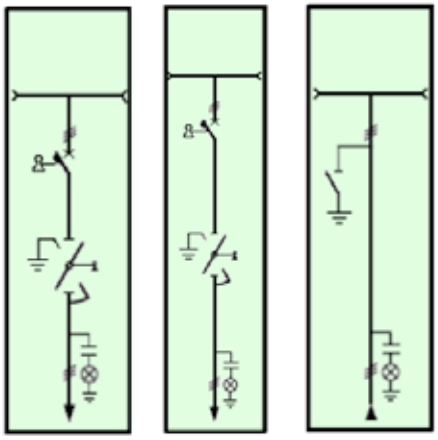
L Type:

It is the switchgear type to be used for power inlet to the power facility, power outlet from the facility or the power segregation in the facility and it can be produced up to 630 A rated current.

F Type:

They are the switchgears to protect and feed the distribution transformers up to 2000 kVA nominal power (depending on nominal voltage) with fuse protection. They have the opening and closing feature with load.

T Type C Type E Type



T Type:

They are the switchgears to protect and feed the distribution transformers up to 200 A rated current with relay protection. They have the opening and closing feature with load.

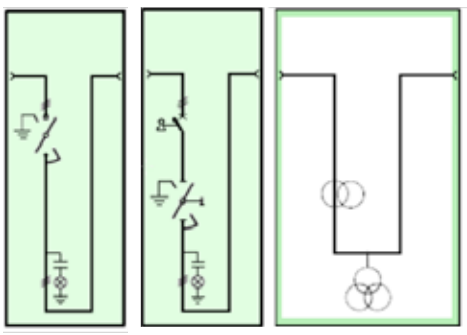
C Type:

It is the switchgear type to be used for power inlet to the power facility, power outlet from the facility or the power segregation in the facility with protecting relays and it can be produced up to 630 A rated current. They have the opening and closing feature with load.

E Type:

They are switchgears without switching systems to ground the main-busbar of the power facility.

U1 Type U2 Type M Type



U1 Type:

They are the switchgears to divide the energised busbar into two in the power facility with a disconnector or connect two different busbar and they are produced up to 630 A rated current. They have the opening and closing feature with load.

U2 Type:

They are the switchgears to divide the energised busbar into two in the power facility with a breaker or disconnector or connect two different busbar and they are produced up to 630 A rated current. They have the opening and closing feature with load.

M Type:

They are the switchgears without switching system to measure the current and voltage of the main busbar of the power facility.

B.3.7.2 Plus Switchgear Types:

PlusType GIS switchgears are superior performance switchgears on the basis of the experiences to be obtained from our Standard Type GIS Switchgears. It can be produced with the nominal current up to 2500 Ampere and nominal short circuit current up to 31,5.

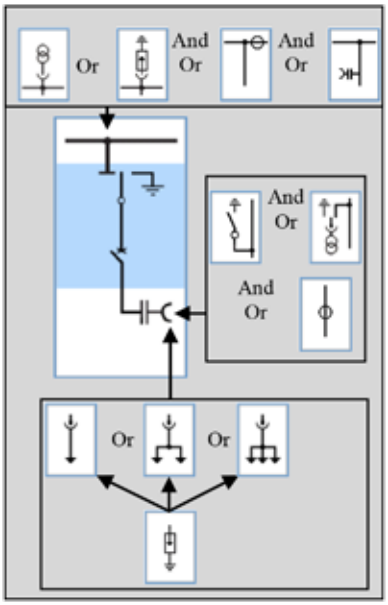
CB Module:

It is the switchgear type to be used for power inlet to the power facility, power outlet from the facility or the power segregation in the facility and it can be produced up to 2500 A rated current. They have the opening and closing feature with load.

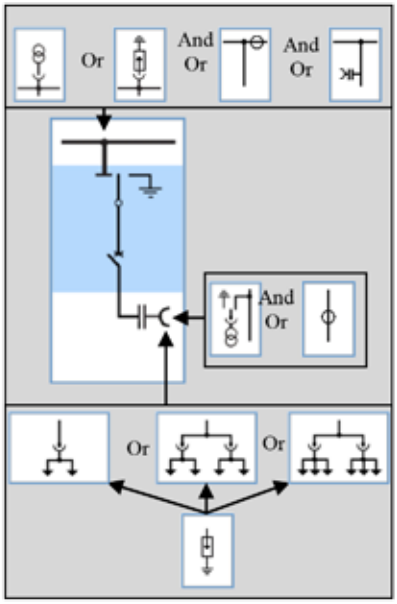
It contains the disconnector and the breaker in the same circuit.

The single or double busbar options are available.

SINGLE BUSBAR

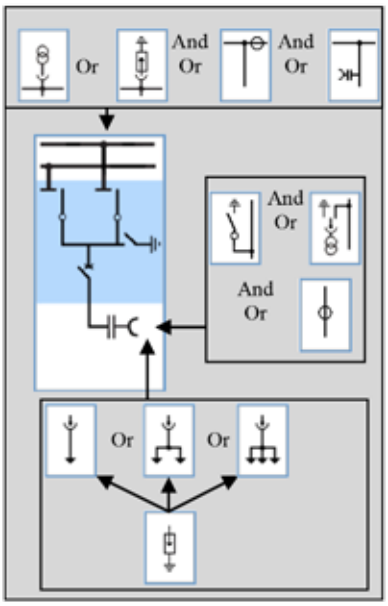


1250A

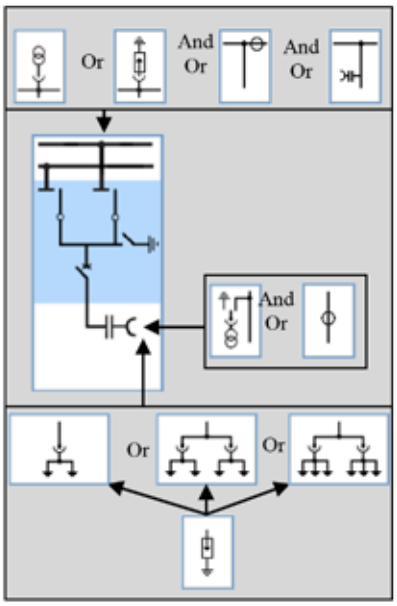


2500A

DOUBLE BUSBAR



1250A



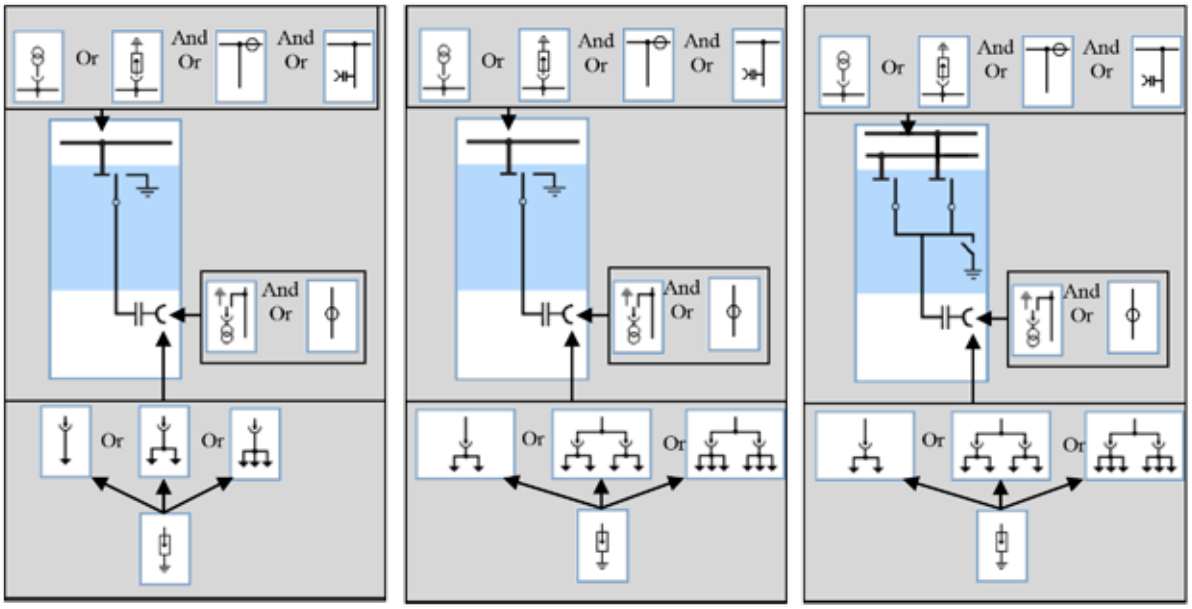
2500A

DS Module

DS Module:

It is the switchgear type to be used for power inlet to the power facility, power outlet from the facility or the power division in the facility and it can be produced up to 2500 A rated current. They have the opening and closing feature with load.

The single or double busbar options are available.



1250A 2500A 2500A

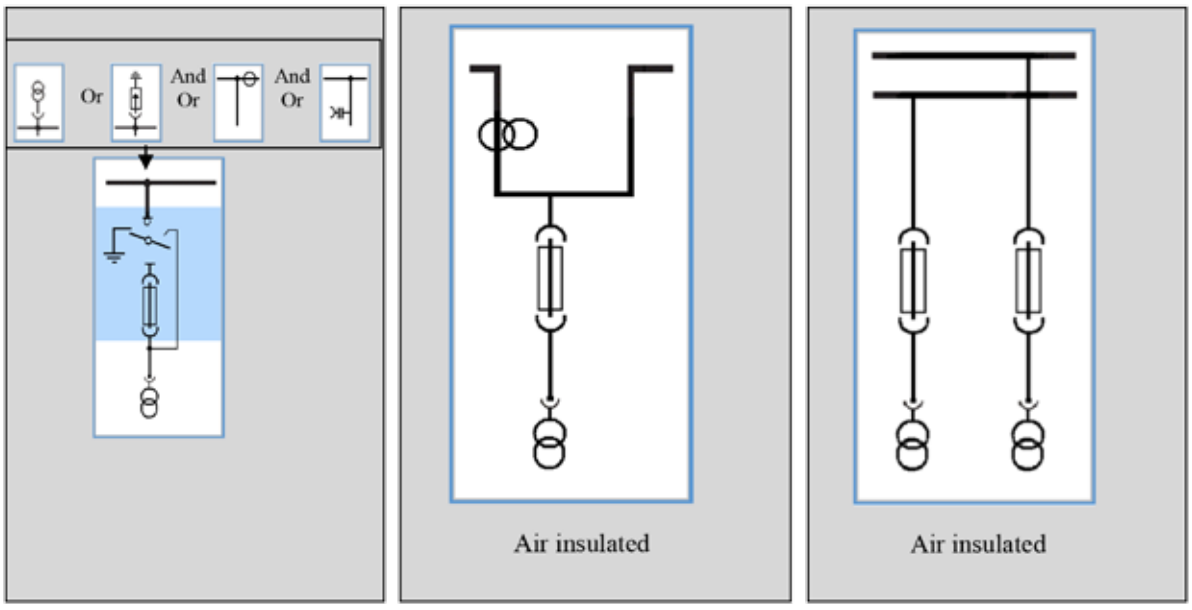
FM Module:

It is the switchgear to measure the current and/or voltage of the energised busbar in the power facility.

M Module:

They are the switchgears measuring the voltage of the main busbar of the power facility without switch system.

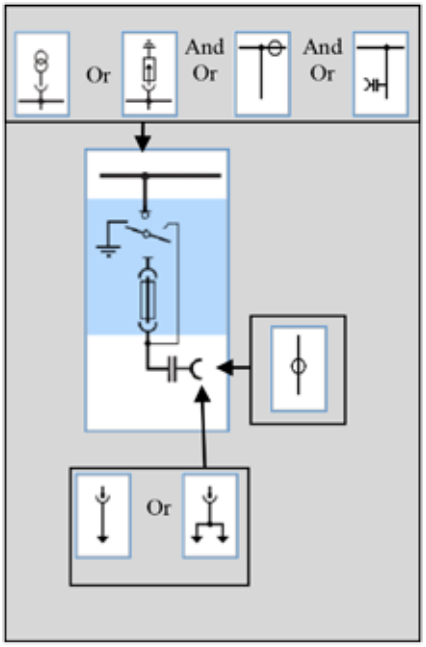
FM Modül **M Modül** **M Modül**



TF MODULE

TF Module:

They are the switchgears to be used for the feeding and protection of the distribution transformers up to 2000 kVA nominal power, with fuse protection. They have the opening and closing feature with load.



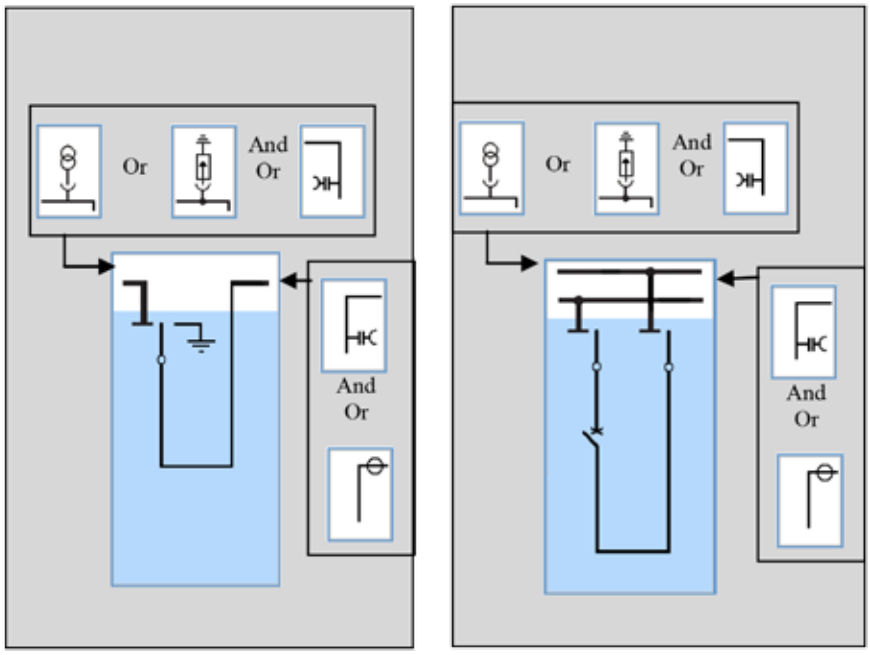
BS Module:

They are the switchgears to divide the energised busbar into two in the power facility with a disconnector or connect two different busbar and they are produced up to 2500 A rated current. They do not have the opening and closing feature with load.

BC Module:

They are the switchgears to divide the energised busbars into two in the power facility with a disconnector and breaker or connect two different busbars and they are produced up to 2500 A rated current in double busbar power facility. They have the opening and closing feature with load.

BS Module **BC Module**



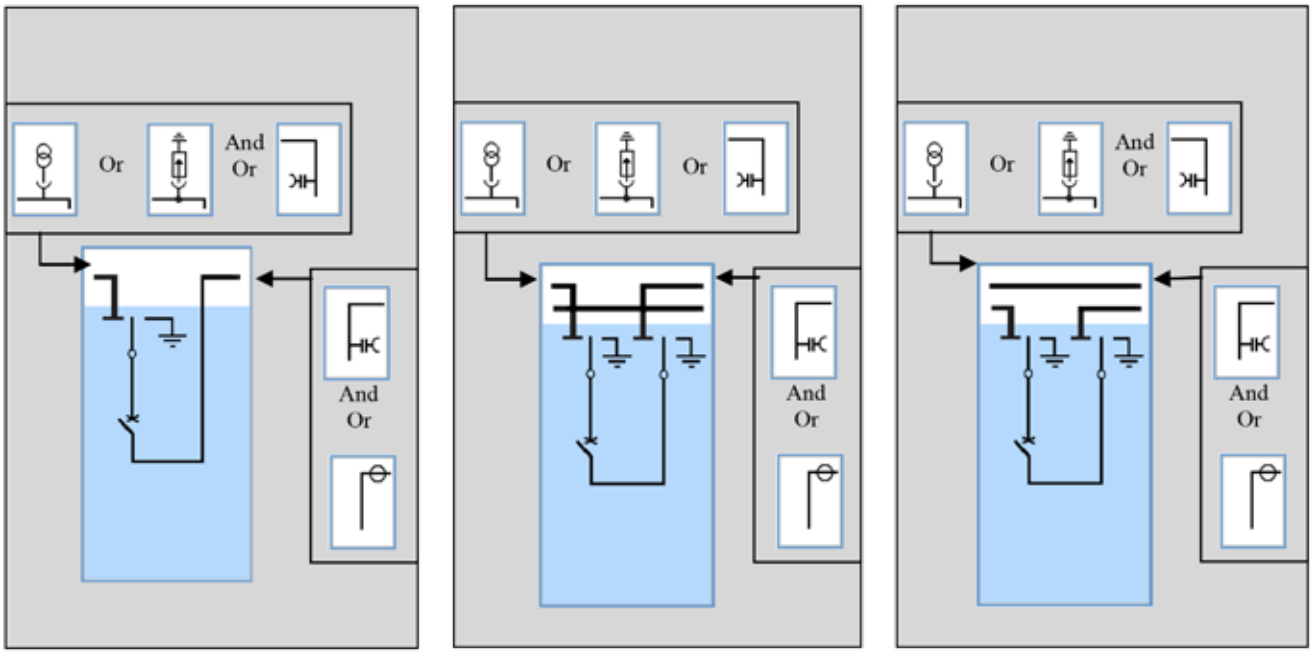
1250/2500A

CBS Module

CBS Module:

They are the switchgears to divide the energised busbars into two in the power facility with a separator and breaker or connect two different busbars and they are produced up to 2500 A rated current in double busbar power facility. They have the opening and closing feature with load.

The single or double busbar options are available.



1250/2500A

1250/2500A

KIOSK TYPE SUBSTATIONS

LSK TYPE STEEL KIOSK TYPE SUBSTATIONS
LCK TYPE POWER HOUSE COMPACT KIOSKS
LMK TYPE MONOBLOCK CONCRETE KIOSKS
LPK TYPE PREFABRICATED CONCRETE KIOSKS



C. Kiosk Type Substations

LMZ Elektromekanik provides the most appropriate products for the projects to the customers in the shortest possible time as it can diversify the products inside as a result of the extended range of kiosk type substations. The fixed building types were constructed for transformer centres until recent times. Due to the construction taking longer times, difficulties in manufacturing, land problems, damage to the environment and some other reasons, these types of centres are started to be replaced with kiosk type substations. General advantages of the kiosk type substations with compare to classical fixed stations are:

- Fabricated production
- Shorter manufacturing duration
- Compact solution
- Strong structure

Kiosk type substations can be considered generally in 4 main parts.

- LSK Type Sheet Steel Kiosk
- LCK Type Powerhouse Compact Kiosks
- LMK Type Monoblock Concrete Kiosks
- LPK Type Prefabricated Concrete KiosksLPK Tipi Prefabrik Beton Köşkler

Respective General Standards

- IEC 62271-202: Prefabricated transformer substations
- IEC 60076: Distribution transformers
- IEC 62271-200: MV switchgears
- IEC 60529: IP protection classes
- IEC 60694: Common characteristic of MV switchgears
- IEC 60721-1: Outdoor classification

Application Areas

- Energy Transmission and Distribution Centers
- Hydroelectric Power Plants
- Solar Energy Plants
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Auto Industry
- Petroleum and Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipelines
- Shipyards
- Emergency Situation and Stand-by Power Plants
- Ore Mines
- Railway Substations

The services which can be provided together with the kiosk type stations are;

- Sheet Steel Kiosk production
- Mechanical and electric assembly of medium voltage switchgears
- Mechanical and electric assembly of distribution transformer
- A Mechanical and electric assembly of low voltage distribution panel
- Electrical connection between medium voltage switchgear and distribution transformer (production and as sembly of the power cables and cable heads, connection of the transformer specific protections with switchgear warning system)
- Low voltage distribution via distribution transformer
- Electrical connection among the panels
- Installation of DC system and performance of required connections,
- Inner kiosk electric installation, completion of illumination circuit and outlet circuits
- Installation of inner kiosk ventilation and cooling circuits (Fan, air conditioning, HVAC System)
- Supply of the security hardware (fire extinguisher, helmet, gloves, high voltage tester, etc.)
- Fire Sensing System, Fire Extinguishing system installations.

C.1. LSK Type Steel Kiosk Type Substations

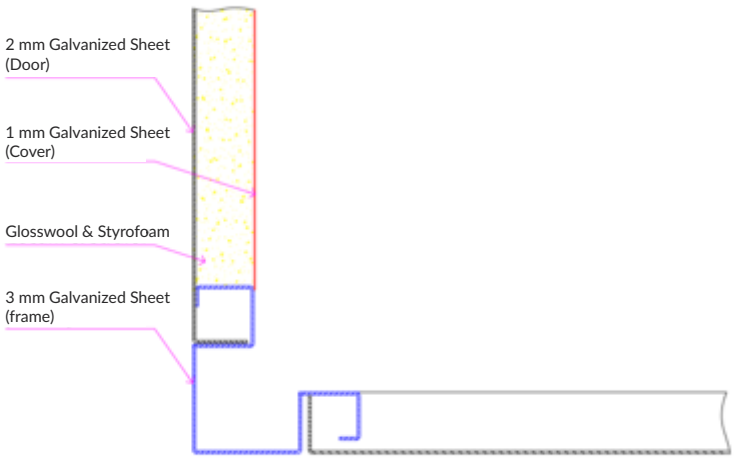


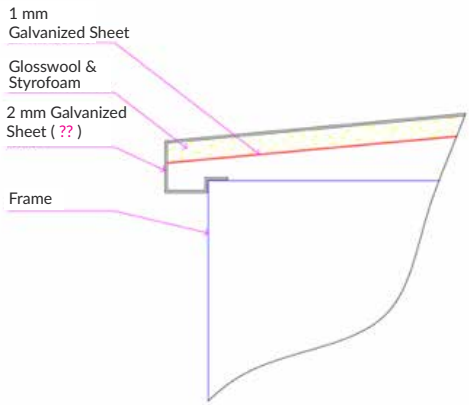
The LSK series Steel Kiosk Type Substations are produced in compliance with EN 62271-202 standards. Its strong structure coming from 3 mm Steel sheet and insulation makes it prominent. Despite the standardisation at certain types and sizes, it can be produced with very different specifications and sizes according the requirements of the project and customers.

The medium voltage switchgears, distribution transformers, low voltage panels and DC systems are dispatched after all the electrical and mechanical assemblies are completed, tested for the least effort in the field for the commissioning under the best conditions. Additional services are also provided for the situations specific to the projects.

C.1.1. General Characteristics;

- 3 mm frame, 2 mm roof and doors made from galvanized sheet steel.
- It has a light and compact structure permitting to change the place whenever it is desired.
- It provides design flexibility permitting different sizes and designs according to the requirements of the project.
- The bottom of the kiosk is applied hot-dip galvanized against oxidisation and corrosion.
- In addition to standard natural ventilation, the external ventilation via fan and air conditioning is also possible.
- The electrostatic powder paint is applied.
- Except for the special designs, the standard manufacture is in compliance with the IP23 protection class.
- The kiosks are equipped with internally required electrical systems and grounding system.
- Sheet steel kiosks can also be manufactured for the use on LMS mobile stations or platforms.
- It is insulated against hot and cold.





C.1.2. Advantages;

- Strong frame structure,
- Ability to be produced and applied in different size and shapes for various applications,
- Operational safety,
- Meeting all the substation requirements,
- Very short commissioning duration,
- Very easy to change the location if necessary and to transport,
- Producible at any time for all climatic condition,
- It can be produced in a way that it can be equipped with all kinds of medium voltage switchgear, low voltage panel, distribution transformer and other switch products.



C.1.3. General Types;

LSK Type kiosks are produced in 2 different types as Distribution Centre and Transformer Centre according to the intended use.



C.1.3.1. Distribution Centres;

They are the kiosks where the medium voltage switchgears between 1-40,5 kV, low voltage distribution panels, command and control panels, signalisation system are supplied together or separately.

They generally consist of a single compartment and the number can be increased according to the project.

C.1.3.2. Transformer Substations;

They are the kiosks where the medium voltage switchgears between 1-40,5 kV, low voltage distribution panels, command and control panels, signalisation system are supplied together or separately.

They generally consist of three compartments and their numbers can be increased according to the project.



These compartments are;

- Medium Voltage Switching Compartment : The compartment including the switchgears up to the level of 1-40,5 kV.
- Transformer Compartment : It is the compartment containing distribution transformer up to 2000 kVA.
- Low Voltage Compartment : It is the compartment having the low voltage distribution, control and command panels.

The transformer centres have 2 different designs in terms of the size as Standard and Small types with reference to their transportation modes.

Type	SS Power (kVA)	Width (mm)	Depth (mm)	Height (mm)
Standard	0... 400	3000	2300	2650
	400...1000	3500		
	1000...1600	4000		
Small	0... 400	3000	2130	2550
	400...1000	3500		
	1000...1600	4000		

C.2. LCK Type Powerhouse Compact Kiosks

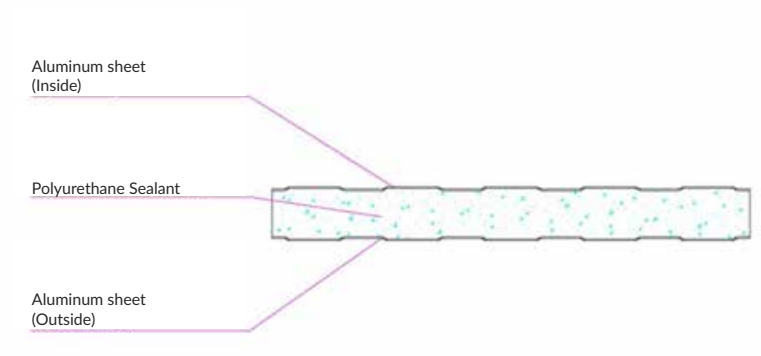
LCK series Powerhouse Compact Kiosks are manufactured in compliance with EN 62271-202 standards. The Powerhouse Compact Kiosks which are developed as an alternative to conventional concrete and fixed type distribution and transformer substations are preferable since they have all the products and possibilities for the operation of a fixed station and higher level of insulation.

Since the Powerhouse Compact Kiosks have a higher level of insulation, they are particularly preferable for facilities such as petroleum, gas and mining facilities. The medium voltage switchgears, distribution transformers, low voltage panels and DC systems are dispatched after all the electrical and mechanical assemblies are completed, tested for the least effort in the field for the commissioning under best conditions. Additional services are also provided for the situations specific to the projects.



C.2.1. General Characteristics;

- It is made from special sandwich panels coated with aluminium sheet on polyurethane filling material.
- If it is required, it has a light and compact structure permitting easy dislocation.
- It provides design flexibility permitting different sizes and designs according to the requirements of the project.
- The bottom of the kiosk is applied hot-dip galvanized against oxidisation and corrosion.
- In addition to standard natural ventilation, the external ventilation via fan, air conditioning or HVAC system is also possible.
- Except for the special designs, the standard manufacture is in compliance with the IP54 protection class.
- Sheet steel kiosks can also be manufactured for the use on LMS mobile substations or platforms.
- If it is required, fire system, fire extinguishing system and emergency lightning can be applied.
- It is highly insulated against hot and cold
- It provides maximum advantageous in oil wells and gas facilities with its ex-proof design.



Panel Detail

C.2.2. Advantages;

- Strong frame structure,
- Easy applicability of higher level protection class
- Inclusion of all the equipment and products which are required for the operation of a fixed station,
- Higher level of heat insulation,
- Ability to be produced and applied in different size and shapes for various applications,
- Operational safety,
- Very short commissioning duration,
- Very easy to change the location if necessary and to transport,
- Producible at any time for all climatic condition,
- It can be produced in a way that it can be equipped with all kinds of medium voltage switchgear, low voltage panel, distribution transformer and other switch products.

C.2.3. General Types;

LCK series Powerhouse Compact Kiosks are produced in 2 different types as Distribution Centre and Transformer Centre according to the intended use.

C.2.3.1. Distribution Substations;

They are the kiosks where the medium voltage switchgears between 1-40,5 kV, low voltage distribution panels, command and control panels, signalisation system are supplied together or separately. They generally consist of a single compartment and their numbers can be increased according to the project.



C.2.3.2. Transformer Substations;

They are the kiosks where the medium voltage switchgears between 1-40,5 kV, low voltage distribution panels, command and control panels, signalisation system are supplied together or separately. They generally consist of three compartments and their number can be increased according to the project.

These compartments are;

- Medium voltage Switch Compartment : The compartment including the switchgears up to level of 1-40,5 kV.
- Transformer Compartment : It is the compartment containing distribution transformer to 2000 kVA.
- Low Voltage Compartment : It is the compartment having the low voltage distribution, control and command panels.

C.3. LMK Type Monoblock Concrete Kiosks

LMK series Monoblock Concrete Kiosks are manufactured in compliance with EN 62271-202 standards and TEDAŞ MYD/2000-036.B technical specifications.

The Monoblock Concrete Kiosks which are developed as an alternative to conventional concrete and fixed type distribution and transformer centres, are preferable due to its practical and easy installation.

It is the most frequently preferred fabricated solution in Turkey.



C.3.1. General Characteristics;

- The pressure strength class of the concrete to be used is C35.
- If it is required, it has a monoblock structure permitting easy dislocation.
- It provides design flexibility permitting different sizes and designs according to the requirements of the project.
- It does not have any material causing oxidisation and corrosion in the frame, base and roof systems.
- In addition to standard natural ventilation, the external ventilation via fan system is also possible.
- The manufacture is in compliance with the IP23D protection class.
- The kiosks are equipped with appropriate electrical inner requirement system and grounding system.
- It is insulated against hot and cold

C.3.2. Advantages;

- Strong frame structure,
- Ability to be produced and applied in different size and shapes for various applications,
- Operational safety,
- Very easy to change the location if necessary and to transport,
- Very short and trouble free commissioning duration as a result of its monoblock structure,
- By the help of the tank basement compartment, the highest profile medium voltage cables are appropriate for their bending radius.
- As the roof can be separated easily, the products can easily be placed into or removed from LMK.

C.3.3. General Types

LMK series Monoblock Concrete Kiosks are produced in 2 different types as Distribution Centre and Transformer Centre according to the intended use.

C.3.3.1 Distribution Substations

They are the kiosks where the medium voltage switchgears between 1-40,5 kV, low voltage distribution panels, control and control panels, signalisation system are supplied together or separately. They generally consist of a single compartment and their numbers can be increased according to the project.

C.3.3.2 Transformer Substations

They are the kiosks where the medium voltage switchgears between 1-40,5 kV, low voltage distribution panels, command and control panels, signalisation system are supplied together. They generally consist of three compartments and their number can be increased according to the project

These Compartments are;

- Medium voltage Switch Compartment : The compartment including the switchgears up to the level of 1-40,5 kV.
- Transformer Compartment : It is the compartment containing distribution transformer up to 1600 kVA.
- Low Voltage Compartment : It is the compartment having the low voltage distribution, control and command panels.

Special Solutions



C.4. LPK Type Prefabricated Concrete Kiosks

LPK series Prefabricated Concrete Kiosks are manufactured in compliance with EN 62271-202 standards and TEDAŞ MYD/2006-52 technical specifications. In many sizes and lands where the Monoblock Concrete Kiosks are not solution, it is developed as an alternative to conventional concrete and fixed type distribution and transformer centres. It is manufactured as fabricated parts and the assembly is achieved in the field. It is the most frequently fabricated solution to be used in Turkey.



C.4.1. General Characteristics;

- The pressure strength class of the concrete to be used is C35,
- It is manufactured as parts and the assembly is completed on site,
- If it is desired, the parts forming the prefabricated structure can be dismantled for re-installation,
- It provides design flexibility permitting different sizes and designs according to the requirements of the project,
- It does not have any material causing oxidisation and corrosion in the frame, base and roof systems,
- In addition to standard natural ventilation, the external ventilation via fan and air conditioning system is also possible,
- The manufacture is in compliance with the IP23D protection class,
- The kiosks are equipped with appropriate electrical internally required systems and grounding system,
- It is insulated against hot and cold.

C.4.2. Advantages;

- Strong frame structure,
- Ability to be produced and applied in different size and shapes for various applications,
- Operational safety,
- Dismantle of prefabricated structures for re-installation,
- Since it is manufactured as parts, the part weights are low, so it is easy to transport,
- By the help of the tank basement compartment, the highest profile medium voltage cables are appropriate for their bending radius.
- Since the inner depth and height can be increased it provides the opportunity to use Metal Clad Switchgear in the Medium
- Voltage system.

MOBILE
SUBSTATIONS

MV / LV MOBILE SUBSTATIONS

MV / MV MOBILE SUBSTATIONS

HV / MV MOBILE SUBSTATIONS





D. Mobile Substations

LMS series mobile substations are moving stations which are manufactured in a manner to meet the project requirements for special demands of the customer with reference to our corporate experiences, project specifications and related standards.

The site and transportation conditions are analysed for the substation project and manufacture, and it is constructed on trailer, prime mover, slide or wagon.

In addition to equip it with all products necessary to run a fixed station and their mechanical and electrical connections to be ready for operation, the mobile structure provides it easy dislocation, as a reason to prefer.

General Aims of Use

- Fixed station construction,
- Fixed station maintenance and repair,
- Insufficient power of the fixed station
- Various reasons resulting with not to install a fixed station.

Mobile Substation Types According to Purpose

- MV / LV Mobile Substations
- MV / MV Mobile Substations
- HV / MV Mobile Substations

D.1. MV / LV Mobile Substations

MV/LV- LMS series mobile substations are moving MV/LV distribution stations to be produced up to 4000 kVA power which are manufactured in a manner to meet the project requirements for special demands of the customer with reference to our corporate experiences, project specifications and related standards. The site and transportation conditions are analysed for the station project and manufacture, and it is constructed on trailer, prime mover, slide or wagon.

In addition to equip it with all products necessary to run a fixed station and their mechanical and electrical connections to be ready for operation, the mobile structure provides it easy dislocation, as a reason to prefer



General Compartments

- Medium Voltage Compartment: 1-52 kV Metal Compartment Switchgears, Metal Enclosed Switchgears or Gas Insulated Switchgears.
- Transformer Compartment: 400-4000 kVA Distribution Transformer
- Low Voltage Compartment: 630-6300 A Low Voltage Distribution Panel / Compensation Panel and Measure ment Panel / DC Distribution Panel
- Battery and Battery Charge Device Compartment: Battery, Battery Drawers and Charge Devices
- Other Compartments; Control and Command Compartment / Generator Compartment

General Characteristics

- Cabinet under IP56 protection class
- Trailer / Prime Mover / Slide / Wagon assembly
- Delivery as ready for use including SCADA system and all other mechanical / electrical equipment to be assembled
- As the safety equipments and commissioning hardware are kept ready in the station, very quick commissioning and readiness for operation

Products and Services to be Contained or can be Contained

- Medium Voltage Switchgears,
- Distribution Transformer,
- Distribution Panel,
- Compensation Panel,
- Earthing Circuit and Equipment
- Measuring Panel, Command and Control panel,
- DC Distribution Panel,
- SCADA System,
- Generator,
- Battery Drawers, Battery, Battery Charge Devices,
- Conductive and Conductive Connection Items,
- Lighting and Auxiliary Circuit Installation,
- Mechanical Assemblies,
- Electrical Assemblies,
- Warning and Caution Sign Labels,
- Test Devices,
- Hand Pieces,
- Safety Materials,
- Fire Alarm and Extinguish System,
- Stairs or Platform



D.2. MV / MV Mobile Substations

MV / MV - LMS series mobile substations are moving MV/MV distribution stations to be produced up to 31,5 MVA power which are manufactured in a manner to meet the project requirements for special demands of the customer with reference to our corporate experiences, project specifications and related standards. The site and transportation conditions are analysed for the station project and manufacture, and it is constructed on trailer, prime mover, slide or wagon.

In addition to equip it with all products necessary to run a fixed station and their mechanical and electrical connections to be ready for operation, the mobile structure provides it easy dislocation, as a reason to prefer.

General Compartments

- Medium Voltage Compartment: 1-52 kV Metal Compartment Switchgears, Metal Enclosed Switchgears or Gas Insulated Switchgears.
- Transformer Compartment: 1000-31500 kVA MV/MV Power Transformer
- Inner Demand Transformer Compartment: 50-400 kVA
- Low Voltage Compartment: 80-630 A Low Voltage
- Distribution Panel / Compensation Panel and Measurement Panel / DC Distribution Panel / Control and Com mand Panel / SACADA System / Automatic Tap Changer
- Battery and Battery Charge Device Compartment: Battery, Battery Drawers and Charge Devices
- Other Compartments; Operator Compartment / Generator

General Characteristics

- Cabinet under IP56 protection class
- Trailer / Prime Mover / Slide / Wagon assembly
- Delivery as ready for use including SCADA system and all other mechanical / electrical equipment to be assembled
- As the safety equipments and commissioning hardware are kept ready in the station, very quick commissioning and readiness for operation

Products and Services to be Contained or can be Contained

- Medium Voltage Switchgears,
- Distribution Transformer,
- Distribution Panel,
- Compensation Panel,
- Earthing Circuit and Equipment
- Measuring Panel, Command and Control panel,
- DC Distribution Panel,
- SCADA System,
- Generator,
- Battery Drawers, Battery, Battery Charge Devices,
- Conductors and Accesories Connection Items,
- Lighting and Auxiliary Circuit Installation,
- Mechanical Assemblies,
- Electrical Assemblies,
- Warning and Caution Sign Labels,
- Test Devices,
- Hand Pieces,
- Safety Materials,
- Fire Alarm and Extinguish System,
- Stairs or Platform.



D.3. HV / MV Mobile Substations

HV/MV – LMS series mobile substations are moving HV/MV distribution stations to be produced up to 31,5 MVA power and 245 kV voltage level which are manufactured for use in HV/MV Distribution networks and High Voltage Transmission Grids. The site and transportation conditions are analysed for the station project and manufacture, and it is constructed on trailer or wagon.

In addition to equip it with all products necessary to run a fixed station and their mechanical and electrical connections to be ready for operation, the mobile structure provides it easy dislocation, as a reason to prefer.



General Compartments

- **High Voltage Compartment:** 52-245 kV Dis connector, Circuit Breaker, Current Transformers, Voltage Transformers, Grounding Disconnector, Surge arresters, Post Insulator or High Voltage SF6 GAS Insulated System
- **Medium Voltage Compartment:** 1-52 kV Metal Compartment Switchgears, Metal Enclosed Switchgears or Gas Insulated Switchgears.
- **Transformer Compartment:** 1000-45000 kVA MV/MV Power Transformer
- **Auxiliary Transformer compartment:** 50-400 kVA
- **Low Voltage Compartment:** 80-630 A Low Voltage Inner Demand Distribution Panel / Compensation Panel and Measurement Panel / DC Distribution Panel / Control and Command Panel / SCADA System
- **Battery and Battery Charge Device Com partment:** Battery, Battery Drawers and Charge Devices
- **Other Compartments;** Operator Compartment / Generator Compartment

General Characteristics

- Cabinet under IP56 protection class,
- Trailer / Prime Mover / Slide / Wagon assembly,
- Delivery as ready for use including SCADA sys, tem and all,
- other mechanical / electrical equipment to be assembled,
- As the safety equipments and commissioning hardware are,
- kept ready in the station, very quick commission ing and readiness for operation.

Products and Services to be Contained or can be Contained

- High Voltage Disconnector,
- High Voltage Breaker,
- High Voltage Current Transformers,
- High Voltage Voltage Transformers,
- High Voltage Grounding Disconnector
- High Voltage Surge Arresters,
- High Voltage Post Insulators

or High Voltage Gas Insulated System (GIS)

- Medium Voltage Switchgears,
- Distribution Transformer,
- Distribution Panel,
- Compensation Panel,
- Earthing Circuit and Equipment
- Measuring Panel, Command and Control panel,
- DC Distribution Panel,
- SCADA System,
- Generator,
- Battery Drawers, Battery, Battery Charge Devices,
- Conductive and Conductive Connection Items,
- Illumination and Inner Requirements Installation,
- Mechanical Assemblies,
- Electrical Assemblies,
- Warning and Caution Sign Labels,
- Test Devices,
- Hand Pieces,
- Safety Materials,
- Fire Alarm and Extinguish System,
- Stairs or Platfom.



RESITORS

NEUTRAL GROUNDING RESISTORS
GENERATOR NEUTRAL GROUNDING AND LEADS CUBICLES



E. Resistors

The resistors which are manufactured by LMZ Electromechanic in order to provide the best appropriateness to the projects, we use various configurations and alloys, and they are defined in 8 main types with reference to the field of applications;

Resistor Types with Reference to the Intended Use

- Neutral Grounding Resistors
- Generator Neutral Grounding And Leads Cubicles
- High Resistance Neutral Grounding Device
- Dynamic Braking Resistors
- Motor Starting And Control Resistors
- Harmonic Filter Resistors
- Current Limiting Resistors
- RC Filters

E.1. Neutral Grounding Resistors

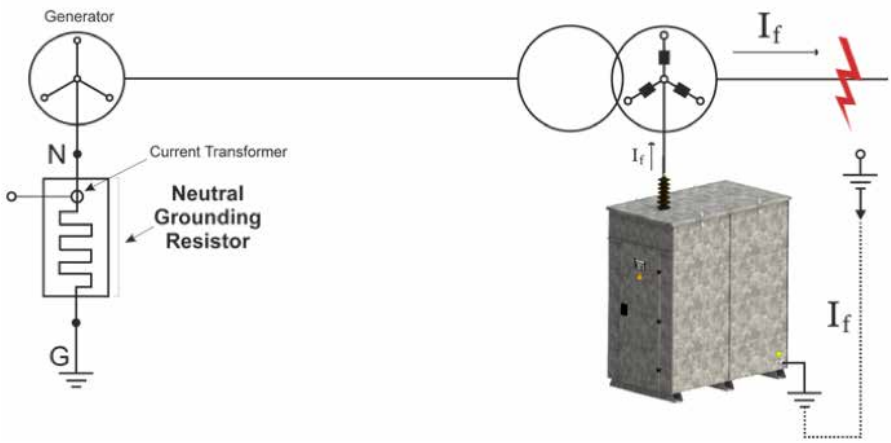
Neutral Grounding Resistors are used for resistance grounding of industrial power system. They are generally connected between ground and neutral of transformers, generators and grounding transformers. Neutral Grounding Resistors are used in order to limit maximum fault current to a value which will not damage the equipment in the power system, yet allow sufficient flow of fault current to operate protective relays to clear the fault. Although it is possible to limit fault currents with high resistance Neutral Grounding Resistors, phase to ground short circuit currents can be extremely reduced. As a result of this fact, protection devices may not sense the fault. Therefore, it is the most common application to limit single phase fault currents with low resistance Neutral Grounding Resistors.

Areas Of Usage

- Reducing single phase fault currents which occur in M.V. electrical networks to prevent damages on transform ers and generators
- Reducing temporary over voltages occurred by braking instantaneous fault current
- Providing long-life for switchgear
- Reducing step voltages to a harmless level for staff







Features:

- Stainless-steel resistor elements
- Current transformer included (EN 60044-1)
- Bolted resistor element connections instead of welded connections in order to be able to assemble spare parts on site immediately
- Typically, RAL 7032(and others) painted
- Typically, 2 mm hot dip galvanized steel enclosure
- High thermal capacity to absorb high currents
- High altitude ratings
- Custom made lifting eyes provide secure lifting
- Rugged shock-resistant construction

E.2. Generator Neutral Grounding And Leads Cubicles

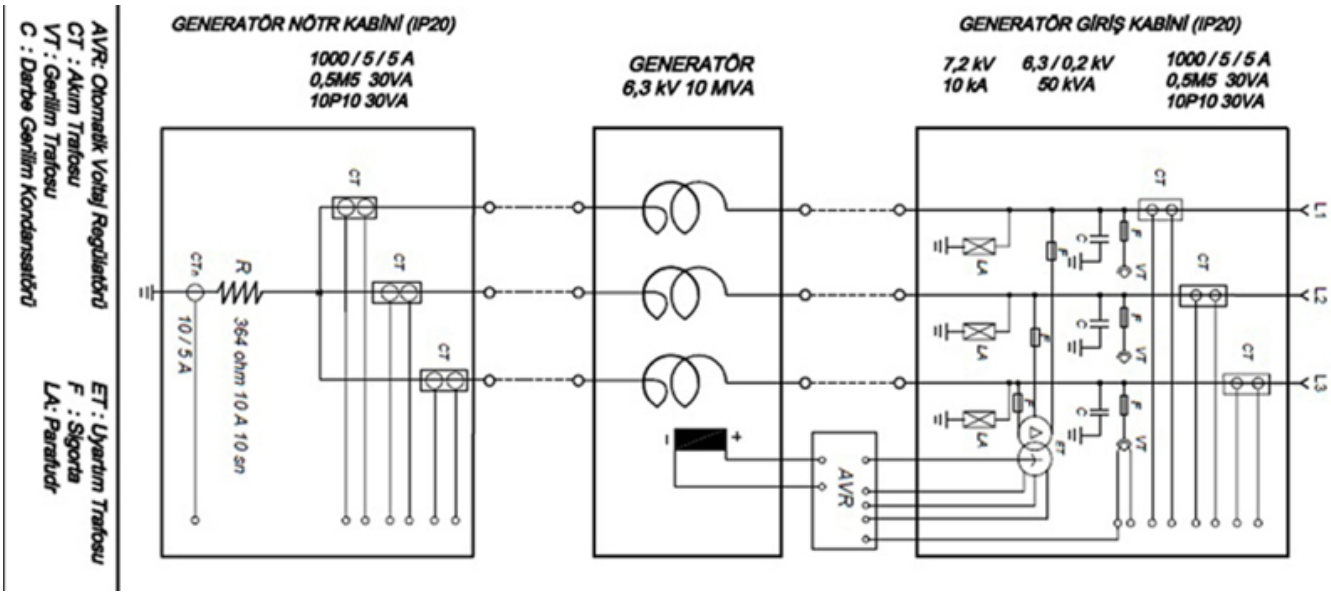
The resistors which are manufactured by LMZ Electro-mechanics in order to provide the best appropriateness to the projects, we use various configurations and alloys, and they are defined in 8 main types with reference to the field of applications;

Generator Neutral Cabinet: They are the cabinets where the generator is earthed and the grounding current data is measured over the star point to be formed over a resistance and required data is obtained at the exit side of the windings. In order to obtain the phase data of the exit tips of the generator winding, 3 current transformer, in order to measure the grounding current on generator star point, 1 current transformer and in order to measure the neutral grounding of the transformer the most appropriately selected resistances are contained.

Generator Incoming Switchgear;

They are the switchgears to be used for the line connection of the generator; they are made in different forms to obtain generator voltage data, generator line current data with Surge arresters to protect the system from impact currents with various feedings.

In order to obtain the generator line current data, 3 current transformer in order to obtain the line voltage data, 3 voltage transformers, the fuse exits for the generator excitation system and 3 Surge arresters protecting the system from impact voltages are contained.







TRANSFORMERS

POWER TRANSFORMERS

DISTRIBUTION TRANSFORMERS

CAST RESIN DRY TYPE TRANSFORMERS

SPECIAL TRANSFORMERS

ACCESSORIES



F. Transformers

F.1. Power Transformers

We produce power transformers up to 150 MVA 220 kV. We are able to respond fast and accurate to needs of our customers with our highly exprienced team. Power transformers that we produce can be separted 4 main groups as intended usage.





Power transformers may be separated into 4 main groups according to its usage purposes;

1. Geneator (step-up) Transformers: They are attached to transmission lines at the side of high voltage winding tied to generator output up to 36 kV of energy power plants. It is important to pay attention to the conditions of warning signs and overload at their designs.
2. Network Transformers: They are usually used as step down transformer at substations. Environmental condiiti-ons, overflow demands and conditions of networks stipulate their designs
3. Industry Transformers: They are used as step down transformers in industrial faciltiies. Since they are often exposed to short circuit in heavy working conditions, it is necessary to take special precaution with their desig-ns.
4. Special Transformers: They are divided as subgroups such as: furnace transformers, furnace reactors, seri-al-shunt reactors, rectifiers and phase shifter transformers.



F.2. Distribution Transformers and Types

F.2.1. Oil Immersed Distrubution Transformers

We are manufacturing distribution transformers with rated power capacity ranging between 50 kVA - 5 MVA, having 36 kVA upper limit, 400 V and around as the lower limit.

We apply rotuine inspections and tests on each of our transformers in accordance with IEC 60076 (TS 267) within our facalities before dispatching to customers. Upon customer's request, we are able to perform typical tests and special tests with our own laboraties except for the mechanical endurance test against short-circuit which can be done in the overseas test laboratories of the international accredited instutuions viz. CESI/Italy/ and IPH/Berlin, Germany,Kema/ Holland.



F.2.1.1 Transformer with Expansion Vessel

They are produced in power range of 25 – 2500 kVA, up to 36 kV high-voltage level, mono-phased or tri-phased, oily, natural cooler (ONAN), idle level convertor or automatic level convertor under load and in a way that they can be used in externally and internally.

Transformers with expansion vessels are same with hermetic transformers in terms of core and coil structures.

Sizes of expansion vessels of transformers are designed in a way that it shall store expansion of oil increased with temperature as the result of the calculations.

Since transformers with expansion vessel are open to atmosphere, oil pressure changing with the thermic effects, air circulation is ensured by dehumidifying the air by silica gel in the vessel of the transformer and oil pressure changing.

As the result of the air circulation arising out of heat differences depending on the load of transformer with expansion vessel operating, it loses its silica gel characteristics in time and causes that oil is humidified and its structure is spoiled. Thus, there are maintenances in certain periods such as exchanging silica gel and measurement of disruptive voltage by taking sample from the oil.



F.2.1.2. Hermetic Transformers



We are produced in power range of 25 – 2500 kVA, up to 36 kV high-voltage level, mono-phased or tri-phased, oily, natural cooler (ONAN), idle level convertor or automatic level convertor under load and in a way that they can be used in externally and internally.

Hermetic transformers are produced in factory in a way that they shall not contact with air by setting pressure.

Oil pressure changing because of thermic effects in hermetic transformers are controlled by expansion-contraction of boiler wave walls and they are designed in way that they shall be able to resist these effects.

Since there is no expansion vessel, oil filling process to the boilers must be made in special vacuum rooms in a way that there shall remain no void. Thus, since there is no moisture in the boiler, deterioration in oil because of oxidisation is decreased to zero.

Heights of hermetic transformers compared to the transformers with expansion vessel are lower. So, they can be used in smaller areas.

Since oil is not in contact with air in hermetic transformers, oil change is not made in certain periods as it is in transformers with expansion vessel. No maintenance is needed except cleaning of bushings of YG and AG bushings.

F.2.2. Cast Resin Dry Type Transformers

Cast-resin dry type Lmz distribution transformers are manufactered in accordance with international quality standard ISO 9001.



They are type of transformers whose HV and LV windings are coated with cast-resin under vacuum and have rated power ranging between 250 kVA- 25 MVA and rated voltage up to 36 kV. They can be manufactured as equipped with natural cooling (AN) system or forced cooling system with fan (AF). (With the usage of fan, up to 50% power increase can be obtained.)

Why dry-type transformers ?

- Epoxy resin casted under vacuum keeps the transformer free from damp and provides protection against ufriendly environments.
- That's why transformers can operate trouble free in humid and dirty environments.
- Since the epoxy resin applied on windings as coating material has fireproof and self extinguishing properties, there isn't any risk of leakage that may cause fire and pollution. That's why they are safe and environment friendly.
- Since the size of dry-type transformers are smaller when compared to those of oil-type transformers, they provide such as advantage that they require less space and less construction works.
- They have relatively low thermal and dielectric aging effect in com parision to oil immersed transformers. These features provide trans former with longer service life.
- They are more useful with their high endurance against short-circuits and high capacity boosting overloads.
- They require no maintenance.
- According to IEC 60076-11;
- Climatic C1/C2
- Environment (condensation and humidity)
- Fire behaviour

F.2.3 Special Transformers

In our research and development departments we are working on many projects regarding out-of-ordinary transformer designs. Our company is well on its way to become a global brand equipped with technical staff selected from professionals.

A leader and pioneer in the quality of service and products provided, ready for international competition, eager to use the highest technology and newest manufacturing techniques and environment-friendly Lmz Elektromekanik, without compromising from its work ethics, evaluates success based on customer pleasures. It provides fast, competitive products that meet their clients' expectations with a dynamic temwork.

Lmz Elektromekanik manufactures these type transformers to satisfy rapid response for emergency situations, trailer mounted, self-contained system transformer, HV and LV switchgear in substations, which contains protection and control equipment.

The substations are designed for easy transport and quick connection.



F.3 Production

F.3.1. Cores

It is core type, manufactured from silicon alloy sheet steels like M5, M4, M3, MOH and ZDHK with directed crystalline orientation (grain-oriented) and having thicknesses of 0,30 mm, 0,27 mm and 0,23 mm. The sheet steel cut to a mitered form of 45 degrees angle at the section where the magnetic flux passes are slitted into intended shape and stacked with CNC slitting machine and packed to form a magnetic circuit. Cutting and packing operations for magnetic circuit are handled with a method known as step-lap which reduces iron losses to a minimum. The core is package by applying step-lap method both crosswise and lenghtwise.

The cross sections of leg and connecting cap pieces are the same and multistepped and theoretically it is assumed to be round cross section.

Core laminations, U-core and connecting cap piece are so compacted by way of steel studs passing through insulated bushings that noise of them are kept minimum.





F.3.2. Windings

Round or flat electrolytic copper or aluminum conductors with resin or paper insulations are used in the distribution transformers windings as conduction material.

Homogeneous distribution of voltage impulses is obtained by means of applying special winding processto windings exposed to high temperatures and voltages, and increasing the thickness of layer at the coil inlet and outlet. Thus, abnormal stresses on the windings are prevented.

According to the designspecifications, the winding configuration could be disc winding or layer winding in power transformers. In order to facilitate the production of the layer windings and eliminate the gaps on the contact surfaces of windings,horizontally and vertically operating winding (and insulation) machines having press-like systems are used.







F.3.3. Tank

Our tanks used to store and keep the cooling and insulation substancein oil type transformers depending on their available cooling surfaces, are manufactured with corrugated walls for the transformers up to 3750 kVA rated power and equipped with radiator for thosegreater than 3150 kA rated power.

CNC plasma shape cutting machine is used in tank production. After finishing the welding works and assembly of tank, it is tested for leakage under pressure in accordance with IEC standards. Tanks with corrugated walls are designed to withstand 0,65 bar vacuum pressure and tanks with radiators are designed to withstand 1 bar vacuum pressure. The finished tanks manufactured in accordance with the customers specifications are sandblasted afterwars.

Cover of the tank is designed in such a way that the winding terminals can go out. There are insulators, phase markings, lifting lugs for taking out the active part,thermometer pocket, grounding bushing and supplementary components on the cover of tank.

There is a possibility of coating the tanks with hot -dip galvanizing, when it is particularly requested to do so. Moreover, again upon request, there is another possibility of providing a safe guard made of sheet steel and assembled on the cover in order to cover and protect bushings pursuant to IEC standards.





F.3.4. Painting

In our ongoing procedure for painting,agray colour known as RAL7033 is used as standard,but we can also manufacturer with different colours on customers request. Our transformers which are painted by way of spilling and spraying methods are primed once and them painted twice on the automated assembly line. Eventually the paint thickness reaches to an extend not less than 105 microns.

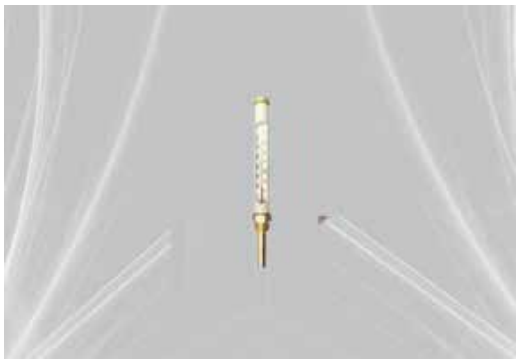




F.4 Accessories

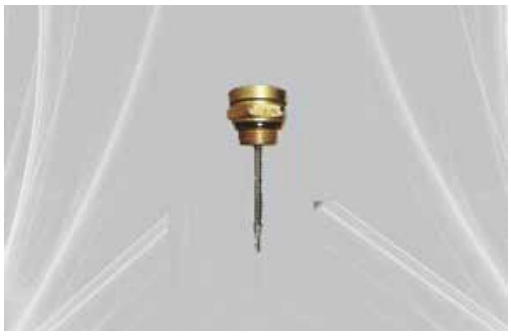
F.4.1 Alcohol-Thermometer

Alcohol thermometer is only used to monitor the temperature of transformer oil and it is without contact.



F.4.2 Pressure Relief Valve

It is preferred in hermetic designs. It protects the transformer vessel in case of sudden pressure increase. It is mounted on the hatch. If boiler is exposed to the internal pressure in which the valve is set, valve is opened and it prevents boiler from getting torn by compensating the pressure by oil discharge. Then, it is automatically closed again. If desired, it can be used with contact.



F.4.3 Buchholz Relay

It is connected with pipes between transformer vessel and oil expansion vessel. It is used to protect transformer in a fault that may occur in electrical equipment in the transformer. When gas arises in insulation materials at the moment of fault, it causes that contacts work by accumulating in reservoir while passing through relay, pushing the float down, or, in sudden faults, activating the valve. There are two independent contacts in the relay for Opening and Alarm. They are 5 A-250 VAC or 0.2 A-250 VDC.



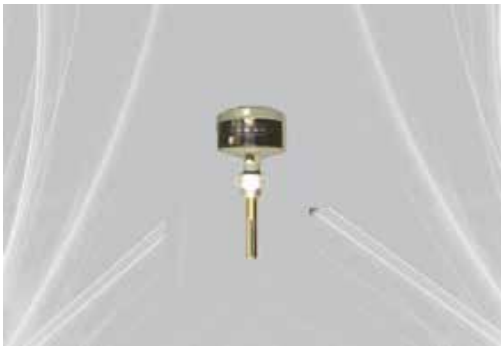
F.4.4 Hermetic Protection Relay

It is preferred in hermetic designs. Relay gas discharge shows the oil temperature and internal pressure in the vessel. It is used in the transformers bigger than 500 kVA. There are two contacts in the relay for each gas discharge, vessel pressure, and oil temperature.



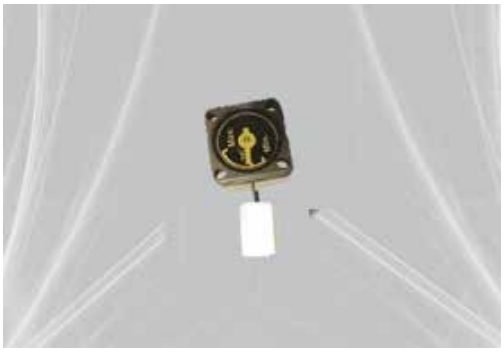
F.4.5 Oil Temperature Thermometer with Contact

There is a maximum gauge showing the maximum temperature that the oil in the transformer reaches and it may be reset with a button down. Oil temperature may be read up to 120o C. There are two settable contact. Electric values of micro-switches are 5 A-250 VAC or 0.2 A-250 VDC.



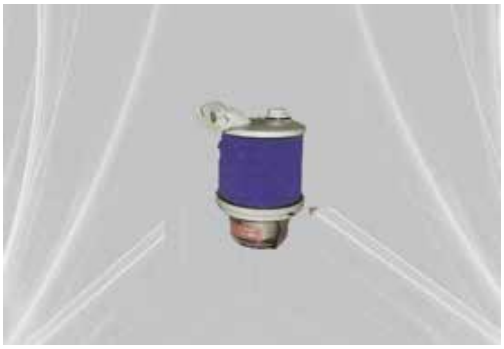
F.4.6 Magnetic Oil Level Gauge

It is used to observe oil level in the oil expansion vessel. Oil level of transformer is shown with a float magnetically connected. Setting of magnetic oil level gauge depends on the expansion vessel. If desired, level gauges with contact are used.



F.4.7 Dehumidifier

Connected to the oil expansion vessel, catching the air through it when oil volume changes, it prevents humidity transition. Size of dehumidifier is used based on the oil and air amount.







Test Laboratory Accreditation

Our aim is, to present a complete, accurate, unbiased and repeatable test process to our customers. ASTOR Test Laboratories are approved by TURKAK. By this accreditation; our test laboratories achieved the status to give test service to other companies as an independent laboratory.

Astor Transformatör A.Ş. has the TS EN 150/IEC 17025:2005 Laboratory Accreditation certificate

APPLIED TESTS

The following routine and typical tests in compliance with TS 267 (IEC 60076), are applied to the transformers completely assembled and filled with oil after drying process:

TYPE TESTS

- Temperature increase (Heat run test)
- Transformer impulse test- ful/ wave
- Audible noise /eve/ measurement
- Tank lifetime test (for hermetically sealed transformers)
- Mechanical endurance test against short-circuit (this test is carried out in test laboratories overseas at CESI/ITALY and / PHI GERMANY)
- All of the tests other than mechanical endurance test against short-circuit are performed in the laboratories of our company.

ROUTINE TESTS AND INSPECTIONS

- Winding resistances measurement
- Turns ratio measurement
- Polarity or check of polarities and connections
- Short-circuit voltage and measurement of load losses
- No-load current and no-load loss measurement
- Induced voltage test
- Measurement of insulation resistances


TÜRK AKREDİTASYON KURUMU

COPY OF THE ACCREDITATION CERTIFICATE

ASTOR TRANSFORMATÖR ENERJİ TURİZM İNŞAAT VE PETROL SAN. TİC. A.Ş.
Deney Laboratuvarı

SPECIAL TESTS

- Winding resistances measurement
- Loss angle (td) measurement (DOBLE - Power factor testing)
- Measurement of paint coat thickness

LMZ ELEKTROMEKANİK SAN. VE TİC. LTD. ŞTİ.
Çamlıca Mah. Anadolu Bulvarı Timco İşyerleri E Blok No: 6
06200 Yenimahalle - Ankara / Türkiye
Tel : +90 312 394 47 21
Fax : +90 312 394 47 22
www.lmz.com.tr
lmz@lmz.com.tr

KOSGEB
www.kosgeb.gov.tr
Ağustos 2016 tarihinde basılmıştır.
Armonia
www.armoniaajans.com