

GENERAL CATALOG

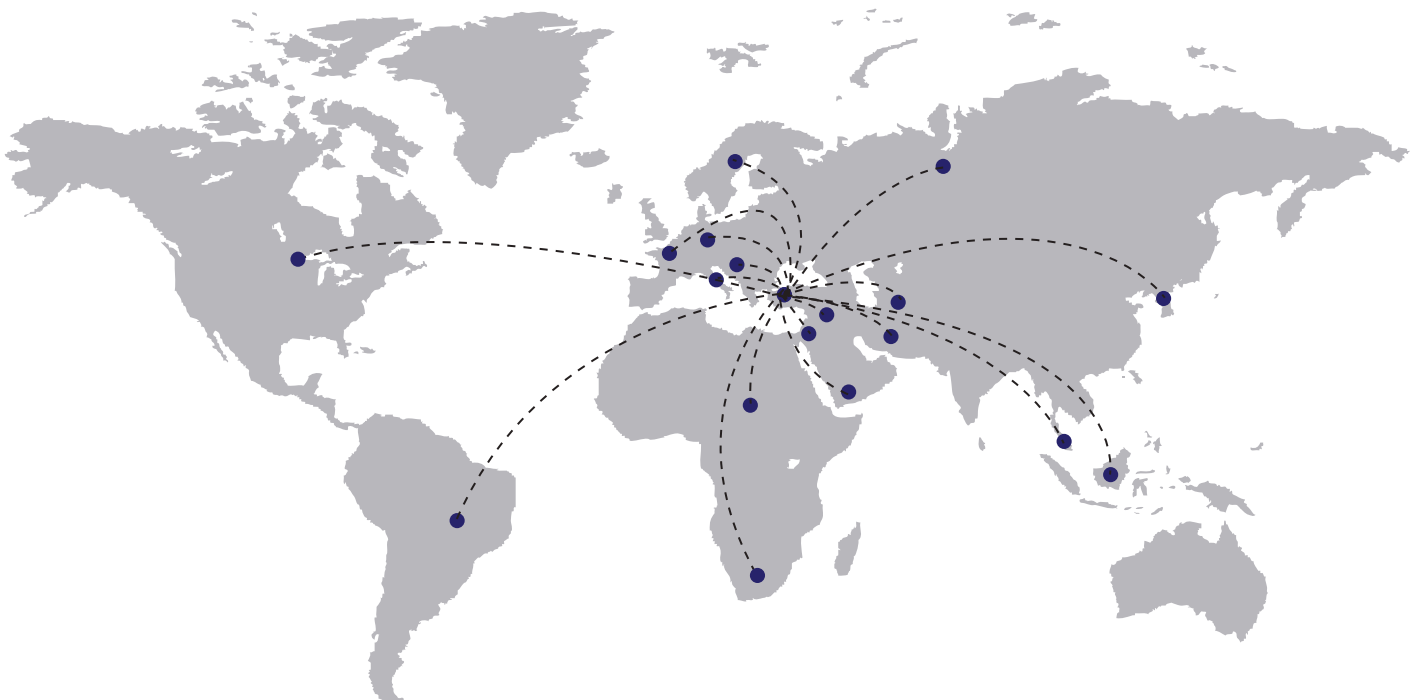
2021



Our Trademarks



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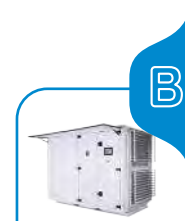
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Group Companies



Aktif Elektroteknik A.Ş.

Aktif Elektroteknik was established in 1981 manufacturing Switchgears, Compact Substations, Mobile Substations and operates in Ankara residing at 6000 m² closed facility with more than 100 employees.

Aktif Elektroteknik is the first company manufactured MV Switchgears and Mobile Substations in Turkey.

Friem S.p.A (Italy) became significant shareholder of Aktif Elektroteknik in 2009 and has been managed by the synergy of internationally experienced group companies of Aktif and Friem.

Aktif Mühendislik A.Ş.

Aktif Mühendislik was established in 1996 and provides solutions to Power Quality, Submetering, Renewable Energy, Railway and operates in İstanbul residing at 2200 m² headquarters with more than 50 employees.

Since its foundation, company has been supplying high quality engineering services in the energy sector with its high-quality products, state-of-art systems, energy saving and cost analysis.

Aktif Mühendislik has been providing custom and standard solutions for its exclusive customers with its more than 20 years of experience.



Aktif Güç Elemanları A.Ş.

Aktif Güç Elemanları was established in 2009 as Elektres for the manufacturing of Power Resistors and operates in Sakarya residing at 3500 m² factory with more than 50 employees.

Company produces Anti-Condensation Heaters, Load Banks, Motor Control / Braking, Neutral Grounding, Filter and Charge / Discharge Resistors that proved to be one of the most important players in the industry.

After acquisition, Elektres kept being used as brand name. R&D activities were also initiated to enlarge its product range to manufacture all power elements.

Aktif Kompanzasyon A.Ş.

Initially, it was started as a department in Aktif Muhendislik since 1996 to provide solutions about power quality problems. Then the Company was established in 2018 as Aktif Kompanzasyon and operating at Aktif Group headquarters.

Staff has more than 20 years of experience and have performed more than 4000 measurements and report and onsite services along with 1500 field and applications and technical solutions.

Company continues its high-quality service and engineering activities for power quality and applications within Aktif Group.



Üçgenler Enerji A.Ş.

Solar plant has been established on 220.000 m² field to generate 10MW electricity from the solar power.

Plant generates electricity according to Turkish Ministry of Energy regulations, designed and built to operate for 25 years under electricity purchasing warranty of government for 10 years.

Plant is designed to operate with 87.5% efficiency to provide 20 GWh annually and has been running with 3% higher performance compared to the initial energy production analysis, and Üçgenler is the owner of 4MW.

Values



Mission

In order to contribute our stakeholder's success and to improve our footprint in terms of technology, price, quality, environment and delivery performances, our mission is to bring the most competitive product and service solutions making energy simple for our customers through with offering possible broadest portfolio.



Service Continuity

The service continuity means efficiency of power and consequently, the profitability of the business.

Our products are designed and manufactured in order to ensure energy sustainability and provide the best service availability.

Quality and Environment

One step beyond, high quality and environmentally-conscious green products. Providing energy continuity and measurable energy efficiency. Also supplying products which hard work simplified, easy to use, smart control logic available.

Vision

Energy is one of the basic requirements for worldwide economic development but the greenhouse gases effect depends to great extent on how the energy is produced. We as AKTİF Group, do endorse Global compact and sustainable development as one of the pillars of our business approach.

We want to be recognized by our stakeholders as the very best performer in competitive energy market in order to achieve the greatest possible returns by innovating, designing, expositing and placing competitive products and services for sustainable and habitable environment by enhancing the standards of living for our planet.



Values

AKTİF values are the group commitment to our customers, our employees, our shareholders and all of the communities at which we play role directly or indirectly.

Our Values are;

- Customer Satisfaction
- Loyalty
- Profitability
- Liability
- Totality
- Equity
- Corporation



Switchgears & Substations

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A1

Switchgears



Energy



Industry



Building



Air Insulated Metal Enclosed Switchgears

SME series Metal Enclosed Switchgears are switching and control cubicles; manufactured up to 40.5 kV, 1250 A, 25 kA and type tested in international accredited laboratories in conformity with IEC 62271-200 standard.

There are two types of SME series metal enclosed switchgears.

- SME-0 : with fixed type circuit breaker
- SME-1 : with withdrawable type of circuit breaker

Advantages

- PI partition class
- AFL internal arc classification
- 3 segregated and earthed accessible compartments
- Electrical and mechanical safety interlocks systems do not allow to operational faults
- Optional withdrawable circuit breaker allows fast and easy servicing
- Air insulated rotary disconnecter switch
- Low maintenance cost with reliable design
- 2 mm steel sheet

Technical Characteristics

- Rated Voltage : up to 40.5 kV
- Power Frequency Withstand Voltage : up to 90/120 kV
- Lighting Impulse Withstand Voltage : up to 190/210 kV
- Rated Frequency : 50/60 Hz
- Rated Current : up to 1250 A
- Short Circuit Withstand Current : up to 25 kA (1 s)
- Internal Arc Current : up to 25 kA (1 s)
- Protection Class (doors are closed) : IP3X
- (between compartment) : IP2X
- Applicable standard : IEC 62271-200



SME

Applications

Metal Enclosed Switchgears are especially used in the transformer centers, distribution systems, renewable energy production and industrial plants where the rated current up to 1250 A and short circuit current up to 25 kA.

- Power Transmission & Distribution
- Renewable Energy Production
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Automotive Industry
- Petroleum and Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipe Lines
- Shipyards
- Emergency Situation and Stand-by Power Facilities
- Mining Industry
- Railway Substations



Voltage	Current	Type	Width	Depth	Height
12 kV	≤ 630 A	LBS	375 mm	900 mm	2000 mm
	≤ 1250 A	C/B	750 mm		
		Measure			
24 kV	≤ 630 A	LBS	375 mm	940 mm	2000 mm
	≤ 1250 A	C/B	750 mm		
		Measure			
36/40.5 kV	≤ 630 A	LBS	750 mm	1400 mm	2250 mm
	≤ 1250 A	C/B	1000 mm		
		Measure			

Air Insulated Metal Enclosed Switchgears

A1

Technical Specifications					
Description		SME 12	SME 24	SME 36	SME 40,5
Rated Voltage	kV	12	24	36	40.5
Rated Insulation Voltage	kV	12	24	36	40.5
Rated Power Frequency Withstand Voltage	kV	28	50	70	90/120
Rated Lightning Impulse Withstand Voltage	kV	75	125	170	90/210
Switchgears Insulation		Air			
Circuit Breaker Type		SF6			
Loss of Service Continuity		LSC-2A			
Partition Class		PI			
Internal Arc Classification		AFL			
Rated Frequency	Hz	50/60			
Rated Short Time Withstand Current	kA	16/25			
Short Time Withstand Duration	s	1			
Internal Arc Withstand Current	kA	16/25			
Internal Arc Withstand Duration	s	1			
Rated Main Busbar Current	A	630 / 1250			
Rated Feeder Current	A	200...1250			
Protection Class (when doors are closed)		IP3X			
Protection Class (between compartments)		IP2X			
Colour (Front/Sides)		RAL 9003 / 7035			
Standards Complied		IEC 62271 - 200			

Mechanical Interlock	SME-0	SME-1
Between Disconnector / Withdrawer / Track and Earthing Disconnector	✓	
Between Disconnector / Withdrawer / Track and Circuit Breaker	✓	
Between Disconnector / Withdrawer / Track and CB Compartment Door	✓	
Between CB Compartment Door and Earthing Disconnector	✓	
Disconnector/Load Break at Low Gas Pressure Breaker / Load Break Locking	✓	
Functional Properties		
Circuit Breaker Type	SF6	
Insulation of Main Disconnector	SF6 / Air	
Withdrawable Circuit Breaker	-	✓
Withdrawable Voltage Transformer	-	
Control Cable Entries from Top, Bottom and Sides	✓	
Ready to Scada Connection	Optional	
Remote CB On/Off	Optional	
Hinged CB Compartment Door	✓	
Manual Spring Charging when Circuit Breaker at Test Position	-	
Manual Spring Charging when Circuit Breaker at Service Position	✓	
Manual On/Off when Circuit Breaker at Service Position	✓	
Manual On/Off when Circuit Breaker at Test Position	-	
Mimic Single Line Diagram and Positioning Indication of Switching Equipment	✓	
Disability of Putting in to Service Position without Fixing the Withdrawer/Truck to Panel	-	
Disability of Putting in to Service Position without Closing Circuit Breaker Door	✓	
Disability of Opening Earthing Switch without Closing Circuit Breaker Door	✓	
Disability of Circuit Breaker Doors Closing without CB Socket Plugging In	-	
Disability of Circuit Breaker Operation when Circuit Breaker is not on Test or Service Position	Optional	
Disability of Disconnector's Closing while Disconnector is Open	✓	
Fast and Easy Changing of Same Valued Circuit Breakers Between Each Other	✓	
Disability of A Circuit Breaker Connecting Inside to Different Valued Cubicle	✓	
Exhaust Options		
Exhaust from Top Inside Substation	-	
Exhaust from Rear Inside Substation	✓	
Exhaust to Outside of Substation by Using Front, Rear or Lateral Arc Channel	Optional	

A1 Air Insulated Metal Clad Switchgears

SMC Series Metal Clad Switchgears are switching and control cubicles; manufactured up to 40.5 kV, 4000 A, 31.5 kA and type tested in international accredited laboratories in conformity with IEC 62271-200 standard.

SMC series Metal Clad switchgears are manufactured in two type;

- SMC-1 : with withdrawable Circuit Breaker
- SMC-2 : with withdrawable Circuit Breaker and Voltage Transformer

Advantages

- LSC-2B Loss of Service continuity
- PM Partition Class
- AFLR internal arc classification
- 4/5 segregated and earthed compartments
- Internal arc test at 31.5 kA/1s
- Electrical and mechanical safety interlocks systems do not allow operational faults
- High level safety and energy continuity
- Fast and easy service with withdrawable Vacuum/SF6 CB
- 3 mm steel sheet construction

Technical Characteristics

- Rated Voltage : up to 40.5 kV
- Power Frequency Withstand Voltage: up to 85 kV
- Lightning Impulse Withstand Voltage : up to 185 kV
- Rated Frequency : 50/60 Hz
- Rated Current : up to 4000 A
- Short Circuit Withstand Current : up to 31.5 kA (3 s)
- Internal Arc Current : 31.5 kA (1 s)
- Protection Class (doors are closed) : IP4X
- (between compartment) : IP2X
- Applicable standard : IEC 62271-200



SMC

Applications

SMC Metal Clad Switchgears are designed especially to use in the primary substations, distribution systems, and industrial plants where the rated current up to 4000 A and short circuit withstand current up to 31.5 kA.

- Power Transmission & Distribution
- Renewable Power Plants
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Automotive Industry
- Petroleum and Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipelines
- Electro Chemical Facilities
- Shipyards
- Emergency Situation and Stand-by Power Plants
- Mining Industry
- Railway Substations
- Oil & Gas



Air Insulated Metal Clad Switchgears

A1

SMC Series Metal Clad Switchgear					
Technical Characteristics					
Description		SMC 12	SMC 24	SMC 36	SMC 40.5
Rated Voltage	kV	12	24	36	40.5
Rated Insulation Voltage	kV	12	24	36	40.5
Rated Power Frequency Withstand Voltage	kV	28	50	70	85
Rated Lightning Impulse Withstand Voltage	kV	75	125	170	185
Switchgear Insulation		Air			
Circuit Breaker Type		Vacuum / SF6			
Loss of Service Continuity		LSC-2B			
Partition Class		PM			
Internal Arc Classification		AFLR			
Rated Frequency	Hz	50/60			
Rated Short time Withstand Current	kA	31.5			
Short Time Withstand Duration	s	3			
Internal Arc Withstand Current	kA	31.5			
Internal Arc Withstand Duration	s	1			
Rated Main Busbar Current	A	630/800/1250/1600/2000/2500/3150/4000			
Rated Feeder Current	A	630/800/1250/1600/2000/2500/3150/4000			
Protection Class (when doors are closed)		IP4X			
Protection Class (between compartments)		IP2X			
Colour (Front/Sides)		RAL 9003 / 7035			
Standards Complied		IEC 62271-200			

Mechanical Interlock	SMC-1	SMC-2
Between Disconnecter / Withdrawer / Track and Earthing Disconnecter	✓	
Between Disconnecter / Withdrawer / Track and Circuit Breaker	✓	
Between Disconnecter / Withdrawer / Track and CB Compartment Door	✓	
Between CB Compartment Door and Earthing Disconnecter	-	
Between Circuit Breaker and Withdrawer's Position	✓	
Accessibility to Cable Compartment With Special Tool / Lock	✓	
Between Shutter and CB Withdrawer / Truck (with Padlock)	✓	
If the Circuit Breaker is Open, it can be Taken to the Service Position	✓	
If the Circuit Breaker is Open, it can be Taken from the Service Position	✓	
Functional Properties		
Circuit Breaker Type	Vacuum / SF6	
Withdrawable Circuit Breaker	✓	
Withdrawable Voltage Transformer	-	✓
Control Cable Entries from Top, Bottom and Sides	✓	
Ready to Scada Connection	Optional	
Remote CB On/Off	Optional	
Hinged CB Compartment Door	✓	
Manual Spring Charging when Circuit Breaker at Test Position	✓	
Manual Spring Charging when Circuit Breaker at Service Position	-	
Manual On/Off when Circuit Breaker at Service Position	-	
Manual On/Off when Circuit Breaker at Test Position	✓	
Mimic Single Line Diagram and Positioning Indication of Switching Equipment	✓	
Disability of Putting in to Service Position without Fixing the Withdrawer/Truck to Panel	✓	
Disability of Putting in to Service Position without Closing Circuit Breaker Door	✓	
Disability of Opening Earthing Switch without Closing Circuit Breaker Door	-	
Disability of Circuit Breaker Door's Closing without CB Socket Plugging In	-	
Disability of Circuit Breaker Operation when Circuit Breaker is not on Test or Service Position	✓	
Disability of Earthing Disconnecter's Closing while Circuit Breaker at Service Position	✓	
Fast and Easy Changing of Same Valued Circuit Breakers Between Each Other	✓	
Disability of A Circuit Breaker Connecting Inside to Different Valued Cubicle.	✓	
Disability of Circuit Breaker Withdrawer/Truck Putting in to Service Position while Earthing Switch is Closed	✓	
Removing of Interlock Between Circuit Breaker and Earthing Switch while Circuit Breaker in Test Position	✓	
Exhaust Options		
Exhaust from Top Inside Substation	✓	
Exhaust from Rear Inside Substation	-	
Exhaust to Outside of Substation by Using Front, Rear or Lateral Arc Channel	Optional	

Air Insulated Metal Clad Switchgears

SNC Series Metal Clad Switchgears are switching and control cubicles; manufactured up to 36 kV, 3150 A, 50 kA and type tested in international accredited laboratories in conformity with IEC 62271-200 standard.

SNC series Metal Clad switchgears are manufactured in two type;

- SNC-1 : with withdrawable Circuit Breaker
- SNC-2 : with withdrawable Circuit Breaker and Voltage Transformer

Advantages

- LSC-2B Loss of Service continuity
- PM Partition Class
- AFLR internal arc classification
- 4 / 5 segregated and earthed compartments
- Thanks to front accessibility to each compartment
- Only 100 mm space from the rear wall
- Designed for 50 kA
- Electrical and mechanical safety interlocks
- Fast and easy service with withdrawable CB
- Fast and easy service with withdrawable VT (SNC-2 only)
- 3 mm steel sheet construction

Technical Characteristics

- Rated Voltage : up to 36 kV
- Power Frequency Withstand Voltage : up to 70 kV
- Lighting Impulse Withstand Voltage : up to 170 kV
- Rated Frequency : 50/60 Hz
- Rated Current : up to 3150 A
- Short Circuit Withstand Current : up to 50 kA (3 s)
- Internal Arc Current : 40 kA (1 s)
- Protection Class (doors are closed) : IP4X
- (between compartment) : IP3X
- Applicable standard : IEC 62271-200



SNC

Applications

SNC Metal Clad Switchgears are designed especially to use in the primary substations, distribution systems, and industrial plants where the rated current up to 3150 A and short circuit withstand current up to 50 kA.

- Power Transmission & Distribution
- Renewable Power Plants
- Diesel and Natural Gas Power Plants
- Transformer Substations
- Cement Factories
- Automotive Industry
- Chemical Industry
- Iron and Steel Industry
- Rolling Mills
- Pipelines
- Electro Chemical Facilities
- Shipyards
- Emergency Situation and Stand-by Power Plants
- Mining Industry
- Railway Substations
- Oil and Gas



Air Insulated Metal Clad Switchgears

A1

SNC Series Metal Clad Switchgear				
Technical Characteristics				
Description		SNC 12	SNC 24	SNC 36
Rated Voltage	kV	13.8	24	36
Rated Insulation Voltage	kV	13.8	24	36
Rated Power Frequency Withstand Voltage	kV	38	50	70
Rated Lightning Impulse Withstand Voltage	kV	75/85	125	170
Switchgear Insulation		Air		
Circuit Breaker Type		Vacuum / SF6		
Loss of Service Continuity		LSC-2B		
Partition Class		PM		
Internal Arc Classification		AFLR		
Rated Frequency	Hz	50/60		
Rated Short Time Withstand Current	kA	16/25/31.5/40/50		
Short Time Withstand Duration	s	3		
Internal Arc Withstand Current	kV	50		
Internal Arc Withstand Duration	s	1		
Rated Main Busbar Current	A	630/800/1250/1600/2000/2500/3150		
Rated Feeder Current	A	630/800/1250/1600/2000/2500/3150		
Protection Class (when Doors Are Closed)		IP4X		
Protection Class (Between Compartments)		IP3X		
Colour (Front/Sides)		RAL 9003 / 7035		
Standards Complied		IEC 62271 - 200		

Mechanical Interlock	SNC-1	SNC-2
Disconnecter / Withdrawer / Track and Earthing Disconnector	✓	
Between Disconnector / Withdrawer / Track and Circuit Breaker	✓	
Between Disconnector / Withdrawer / Track and CB Compartment Door	✓	
Between CB Compartment Door and Earthing Disconnector	-	
Between Circuit Breaker and Withdrawer's Position	✓	
Accessibility to Cable Compartment With Special Tool / Lock	✓	
Between Shutter and CB Withdrawer / Truck (with Padlock)	✓	
If the Circuit Breaker is Open, it can be Taken to the Service Position	✓	
If the Circuit Breaker is Open, it can be Taken from the Service Position Position	✓	
Functional Properties		
Circuit Breaker Type	Vacuum / SF6	
Withdrawable Circuit Breaker	✓	
Withdrawable Voltage Transformer	-	✓
Control Cable Entries from Top, Bottom and Sides	✓	
Ready to Scada Connection	Optional	
Remote CB On/off	Optional	
Hinged CB Compartment Door	✓	
Manual Spring Charging when Circuit Breaker at Test Position	✓	
Manual Spring Charging when Circuit Breaker at Service Position	-	
Manual On/Off when Circuit Breaker at Service Position	✓	
Manual On/Off when Circuit Breaker at Test Position	✓	
Mimic Single Line Diagram and Positioning Indication of Switching Equipment	✓	
Disability of Putting in to Service Position without Fixing the Withdrawer/Truck to Panel	✓	
Disability of Putting in to Service Position without Closing Circuit Breaker Door	✓	
Disability of Opening Earthing Switch without Closing Circuit Breaker Door	-	
Disability of Circuit Breaker Door's Closing without CB Socket Plugging In	✓	
Disability of Circuit Breaker Operation when Circuit Breaker is not on Test or Service Position	✓	
Circuit Breaker Closing while Disconnector is Open	N/A	
Disability of Earthing Disconnector's Closing while Circuit Breaker at Service Position	✓	
Disability of Disconnector's Closing while Disconnector is Open	N/A	
Fast and Easy Changing of Same Valued Circuit Breakers Between Each Other	✓	
Disability of A Circuit Breaker Connecting Inside to Different Valued Cubicle.	✓	
Disability of Circuit Breaker Withdrawer/Truck Putting in to Service Position while Earthing Switch is Closed	✓	
Removing of Interlock Between Circuit Breaker and Earthing Switch while Circuit Breaker in Test Position	✓	
Exhaust Options		
Exhaust from Top, Inside Substation	Optional	
Exhaust from Rear, Inside Substation	-	
Exhaust to Outside of Substation by Using Front, Rear or Lateral Arc Channel	Optional	

Air Insulated Metal Clad Switchgears

Double Busbar System

SNC-DB Series Double Busbar Switchgears are switching and control cubicles; manufactured up to 36 kV, 2500 A, 50 kA and type tested in international accredited laboratories in conformity with IEC 62271-200 standard.

SNC-DB series Metal Clad switchgears are manufactured in two type;

- SNC - 0.DB : with fixed Circuit Breaker
- SNC - 1.DB : with withdrawable Circuit Breaker
- SNC - 2.DB : with withdrawable Circuit Breaker and Voltage Transformer

Advantages

- LSC-2B Loss of Service continuity
- PM Partition Class
- AFLR internal arc classification
- 4 / 5 segregated and earthed compartments
- Thanks to front accessibility to each compartment only 100 mm space between rear wall
- Designed for 50 kA
- Electrical and mechanical safety interlocks
- Fast and easy service with optional withdrawable CB & VT
- 3 mm steel sheet construction

Technical Characteristics

- Rated Voltage : up to 36 kV
- Power Frequency Withstand Voltage : up to 70 kV
- Lighting Impulse Withstand Voltage : up to 170 kV
- Rated Frequency : 50/60 Hz
- Rated Current : up to 2500 A
- Short Circuit Withstand Current : up to 50 kA (3 s)
- Internal Arc Current : 40 kA (1 s)
- Protection Class (doors are closed) : IP4X
- (between compartment) : IP3X
- Applicable Standard : IEC 62271-200



SNC-DB

Applications

SNC-DB Metal Clad Switchgears are designed especially to use in the primary substations, distribution systems, and industrial plants where the rated current up to 3150 A and short circuit withstand current up to 50 kA.

- Energy Transmission and Distribution Centers
- Renewable Energy Production
- Conventional Energy Production
- Transformer Substations
- Iron and Steel Industry
- Oil and Gas
- Petrochemical Industry



Metal Clad Switchgears Dimensions

A1

SMC

Voltage	Current	Width		Depth		Height
		Vacuum CB	SF6 CB	Vacuum CB	SF6 CB	
12 kV	≤ 1600	800 mm	1100 mm	2000 mm	2250 mm	2100 mm
	2000 - 2500 A	1000 mm				
	3150 A	1100 mm				
24 kV	≤ 1600	1000 mm	1100 mm	2000 mm	2250 mm	2100 mm
	2000 - 2500 A	1100 mm				
	3150 A	-				
36 kV	≤ 2500	1200 mm	1400 mm	≤ 3000 mm *	3000 mm	2300 mm
	3150 A	1400 mm		3550 A		
	4000 A		-		-	
40.5 kV	≤ 2500	1400 mm	-	3550 mm	-	2550 mm

* Depth changes according to C/B used

SNC

Voltage	Current	Width	Depth		Height
			SNC-1	SNC-2	
12 kV *	≤ 1250 A	650 mm	1400 mm	1750 mm	2445 mm
	1600 - 2000 A	800 mm			
	2500 - 3150 A	1000 mm			
24 kV	≤ 1250 A	800 mm	1750 mm	1750 mm	2570 mm
	1600 - 3150 A	1000 mm			
36 kV	≤ 1250 A	1100 mm	2350 mm	2350 mm	2820 mm

* Tested and certified for 13,8 kV

SNC-DB Double Busbar

Voltage	Current	Width	Depth			Height
			SNC-0DB	SNC-1DB	SNC-2DB	
12 kV	≤ 1250 A	800 mm	1400 mm			3000 mm
	1600 - 2500 A	1000 mm				
24 kV	≤ 1250 A	1000 mm	1750 mm			2570 mm
	1600 - 2500 A	1200 mm				
36 kV	≤ 1250 A	1400 mm	2900 mm			4050 mm
	1600 - 2500 A	1500 mm				4250 mm

Switching Equipment and Accessories

Rotary Disconnectors

SRS series Rotary Disconnector Switches are manufactured according to IEC 62271-102 standard.

SRS type Rotary Disconnector are manufactured as 3 poles and 2 positions. Together with SES type earthing switches, it can be used as 3 poles and 3 positions.

When on-load switching operation isn't necessary, the disconnecting operation can be done safely without required any other switching equipment.

In case of on-load switching operation the disconnecting operation can be done safely together with connectors or circuit breakers.



SRS

Technical Characteristics

- Rated Voltage : up to 36 kV
- Power Frequency Withstand Voltage: up to 70 kV
- Lighting Impulse withstand Voltage : up to 170 kV
- Rated Frequency : 50/60 Hz
- Rated Current : up to 1250 A
- Short Circuit withstand Current : up to 25 kA (1 s)
- Mechanical Endurance : 1.000 Operation cycle
- Applicable standard : IEC 62271-102

SRS series Rotary Disconnector

Product Type	Ur*	Ir	Ik	tk	Ud	Up	Ip
SRS-12/630-1601	12 kV	630 A	16 kA	1 s	28 kV	75 kV	40 kA
SRS-12/630-2001			20 kA				50 kA
SRS-12/630-2501			25 kA				63 kA
SRS-12/1250-1601		1250 A	16 kA				40 kA
SRS-12/1250-2001			20 kA				50 kA
SRS-12/1250-2501			25 kA				63 kA
SRS-36/630-1601	36 kV	630 A	16 kA		70 kV	170 kV	40 kA
SRS-36/630-2001			20 kA				50 kA
SRS-36/630-2501			25 kA				63 kA
SRS-36/1250-1601			16 kA				40 kA
SRS-36/1250-2001			20 kA				50 kA
SRS-36/1250-2501			25 kA				63 kA

* Available with and without earthing mechanism.

Switching Equipment Dimensions

Earthing Switches

A1

SES series Earthing Switches are used for earthing the medium voltage systems in safety.

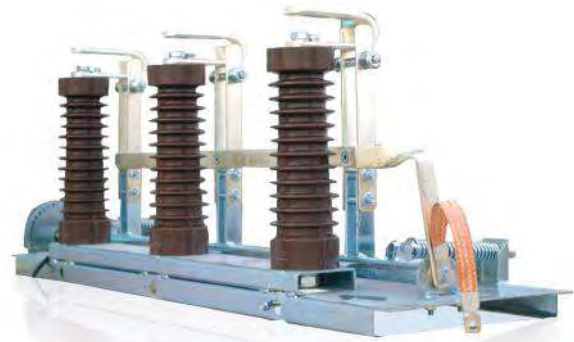
SES series Earthing Switches can operate with all type of disconnector mechanism. Thanks to the air insulated type, disconnector contact position can be observed easily.

SES series Earthing Switches are manufactured according to class E2-B to have 5 times making capacity.

SES series Earthing Switches are manufactured according to IEC 62271-102 standard.

Technical Characteristics

- Rated Voltage : up to 36 kV
- Power Frequency Withstand Voltage : up to 90/120 kV
- Lighting Impulse withstand Voltage : up to 190/210 kV
- Rated Frequency : 50/60 Hz
- Rated Current : up to 4000 A
- Short Circuit withstand Current : up to 50 kA
- Short Circuit withstand Time : 1 / 3 s
- Mechanical Endurance : 1E2-B
- Applicable standard : IEC 62271-102



SES

SES series Earthing Switches

Product Type	Ur	Ik*	Ud	Up	Ip
SES-12/0000-1601	12 kV	16 kA	28 kV	75 kV	40 kA
SES-12/0000-2001		20 kA			50 kA
SES-12/0000-2501		25 kA			63 kA
SES-12/0000-3101		31.5 kA			80 kA
SES-12/0000-4001		40 kA			100 kA
SES-12/0000-5001		50 kA			125 kA
SES-24/0000-1601	24 kV	16 kA	50 kV	125 kV	40 kA
SES-24/0000-2001		20 kA			50 kA
SES-24/0000-2501		25 kA			63 kA
SES-24/0000-3101		31.5 kA			80 kA
SES-24/0000-4001		40 kA			100 kA
SES-24/0000-5001		50 kA			125 kA
SES-36/0000-1601	36 kV	16 kA	70 kV	170 kV	40 kA
SES-36/0000-2001		20 kA			50 kA
SES-36/0000-2501		25 kA			63 kA
SES-36/0000-3101		31.5 kA			80 kA
SES-36/0000-4001		40 kA			100 kA
SES-40/0000-1601	40.5 kV	16 kA	90-120 kV	190-210 kV	40 kA
SES-40/0000-2001		20 kA			50 kA
SES-40/0000-2501		25 kA			63 kA
SES-40/0000-3101		31.5 kA			80 kA
SES-40/0000-4001		40 kA			100 kA

* : Available as 1 or 3 sec.

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A2

Substations



Energy



Industry



Building



A2 E-House / Compact Substations

Made by Sheet Steel

SCK-1 Series

SCK-1 series compact substations are made of galvanized sheet steel with requested dimensions, according to IEC 62271-202 standard.

Advantages

- Internal arc classification in compliance with IAC A and B
- IP23D protection class
- Galvanized sheet steel construction, hot-dip galvanized steel frame, electrostatic powder coat and NPU base profiles
- Optional HVAC, fire detecting and extinguishing system
- Suitable design for each type LV and MV panels.
- Possibility to design on Trailer or rail

Technical Characteristics

- Altitude : 1000 m
- Ambient temperature : -5 ... +50 °C
- Pollution degree : Class 3
- Maximum Solar Radiation: 1000 W/m²
- Earthquake Resistance : 0.5 g horizontal and vertical
- Inner wall thickness : 1 mm Galvanized steel sheet
- Outer wall thickness : 2 mm Galvanized steel sheet
- Frame thickness : 3 mm Hot-dip Galvanized steel sheet
- Wall Thickness : 40 mm
- Insulation material : EPS (Expanded Polystyren Foam)
- Insulation density : 1.8 kg/m³
- Incombustibility degree : E
- R Value : 7
- Protection Class : up to IP23D
- Applicable Standards : IEC 62271-202



SCK-1



Applications

- Power Transmission & Distribution
- Renewable Energy Production
- Transformer Substations
- Oil and Gas
- Petrochemical Industry

SCK-2 Series

SCK-2 series compact substations are produced especially in compliance with Zone 2 Hazardous area conditions for power distribution at Oil & Gas applications.

Advantages

- Internal arc classification in compliance with IAC A and B
- Protection class from IP23D up to IP54
- Suitable insulation material to ambient conditions
- NPU or NPI base profiles made by hot-dip galvanized against corrosion
- Doors can be opened 120° outside and designed against to 20 J mechanical shock
- Rubber floor covering at level of 50kV and has A1 incombustibility degree
- HVAC, fire detecting and extinguisher system
- Special design and production to application
- Suitable design for each type LV and MV panels.
- Possibility to design on trailer or rail

Technical Characteristics

- Altitude : 1000 m
- Ambient Temperature : -25 ... +50 °C
- Earthquake Resistance : 0.5 g horizontal and 0.4 g vertical
- Ur : max 40.5 kV
- Fr : 50/60 Hz
- IAC : A and B
- IP : up to IP54
- Steel Class : St 37
- Hazardous Area : Zone2
- Applicable Standards : IEC 62271-202



SCK-2



Applications

- Power Transmission & Distribution
- Renewable Energy Production
- Transformer Substations
- Oil and Gas
- Petrochemical Industry

A2 E-House / Compact Substations

Made by Concrete

SMK series monoblock concrete kiosks are used for transformer and distribution substations manufactured up to 1600 kVA transformer power.

SMK series monoblock concrete kiosks are manufactured in accordance with IEC and MYD standards and certified as type tested from international accredited laboratories.

Advantages

- Modular design
- Operation in safety
- Easy transport and start up
- Long service life
- High strength due to C35 concrete
- Internal arc classification in compliance with IAC A and B
- Safety and tested earthing circuits
- Different product solutions to special projects
- Suitable design for each type LV and MV panels.

Technical Characteristics

- | | |
|------------------------------|---------------------------------|
| • Altitude | : 1000 m |
| • Ambient temperature | : -5...+50 °C |
| • Pollution degree | : Class 3 |
| • Maximum solar radiation | : 1000 W/m ² |
| • Earthquake resistance | : 0.5 g horizontal and vertical |
| • IAC | : A and B |
| • IP | : IP23D |
| • CI | : 10 |
| • Compressive strength class | : C35 |
| • Applicable standard | : IEC 62271-202 |



SMK

SPK series prefabricated concrete kiosks are used for transformer and distribution substations manufactured up to 2500 kVA transformer power.

SPK series prefabricated concrete kiosks are manufactured in accordance with IEC and MYD standards and certified as type tested from international accredited laboratories.

Advantages

- Easy assembly and disassembly on site
- High strength due to C35 concrete
- Internal arc classification in compliance with IAC A and B
- Safety-tested earthing circuits
- Suitable depth dimensions for installment of metal clad switchgear
- Different product solutions to special projects
- Manufacturing in compliance with internal arc test received from accredited laboratories
- Suitable design for each type LV and MV panels.

Technical Characteristics

- | | |
|------------------------------|---------------------------------|
| • Altitude | : 1000 m |
| • Ambient temperature | : -5...+50 °C |
| • Pollution degree | : Class 3 |
| • Maximum solar radiation | : 1000 W/m ² |
| • Earthquake Resistance | : 0.5 g horizontal and vertical |
| • IAC | : A and B |
| • IP | : IP23D |
| • CI | : 10 |
| • Compressive strength class | : C35 |
| • Applicable standard | : IEC 62271-202 |



SPK

SMS series Mobile Substations are transformer and distribution substations, offer flexible and efficient solutions.

SMS series mobile substations are used for applications like temporary power demands, mining applications, military camps, industrial facilities, emergency power demands and additional power requests.

SMS series mobile substations can be mounted on trailer, platform, wagon, vessel according to the application and HV switching equipment can be chosen as gas insulated or air insulated. Complete substation can be equipped with remote control systems. SMS series mobile substations can be produced in a short time and low cost in comparison with fixed type substations.

Advantages

- Mobile design
- Operation in safety
- Easy and quick transport and installment
- Special design solutions for different applications
- Different applications on trailer, platform, wagon, vessel
- Quick solution for emergency power or additional power requests

Types

- SMS 1 : 3.6 – 40.5 kV / 0.23 - 0.69 kV, 50/60 Hz, 0.5 - 4 MVA
- SMS 2 : 3.6 – 40.5 kV / 1 - 24 kV, 50/60 Hz, 1 – 31.5 MVA
- SMS 3 : 52 - 245 kV / 3.6 - 40.5 kV, 50/60 Hz, 1 - 45 MVA

Application

- Temporary Power Demands
- Emergency Power Demands
- Additional Power Necessities
- Mining Applications
- Military Camps
- Industrial Facilities



SMS 2



SMS 3

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B

Power Resistors



Energy



Industry



Building



Traction



Renewable Energy
Systems



Grounding Solutions

Neutral Grounding Resistors

Our resistors are manufactured against harsh weather and industrial conditions with the range from low voltage to high voltage at 52 kV insulation level and from low currents up to high currents of 10 kA.

The most common requirements are manufactured with the line of standard products and the others are designed and developed as tailor made according to the project characteristics.

Technical Characteristics

- Nominal Voltage : up to 52 kV insulation class
- Fault Current : up to 10 kA
- Fault Duration : according to request
- Applicable Standards : ANSI/IEEE Std 32, IEEE-C57.32, IEC 60071, IEC 60060-1

Other Parameters

- Continuous current rating; important for the resistor performance especially at high IP degrees
- Protection degree of enclosure; standard IP23, available from IP00 (w/o enclosure) to IP55,
- Enclosure; hot dip galvanized is standard, AISI304 / AISI316 stainless steel and RAL 7035 color are options
- Auxiliary components; Disconnecter Switch, Current Transformers, Voltage Transformer, Surge Arrester, etc.



GR

How to ground an electrical system is an important decision for the electricity generation and distribution system.

The purpose of system grounding is;

- to control the system's voltage with the respect to ground, within predictable limits,
- to provide for a flow of current that will allow detection of a short-circuit between phases and ground and disable the voltage source (such as transformer or generator).

The basic methods of neutral grounding are as follows and each has its own purpose, advantage and disadvantage;

1. Through a Resistance
 - Low-resistance
 - High-resistance
2. Through a Reactance
3. Through a Peterson Coil (Resonant Grounding)
4. Through a Solidly grounded system
5. Through a Transformer
 - Consist of a Single-Phase Transformer and Resistor,
 - Zig-zag Transformer,
 - Wye-Delta Transformer,
 - Wye-Open Delta Transformer



Grounding Solutions

Neutral Grounding Transformers

Neutral Grounding System Through a Single-Phase Transformer and a Resistor

A single-phase grounding transformer and neutral grounding resistor are used together in this system. This system is particularly suitable for grounding of generators, because this system behaves normally as a non-grounded system but limits the fault current when a phase to ground fault occurs. The primary winding of the grounding transformer is connected to the neutral winding of the system and neutral grounding resistor is connected to the secondary winding of grounding transformer.

Obtain the System Neutral with Zig-Zag Transformer

In the case of delta-connected systems with no neutral point or if the neutral point cannot be reached in some way, an earthing transformer is used to create an artificial neutral point and system can be grounded via this neutral point. Most grounding transformers are designed to expose fault current below 1 min (usually 10 s), so they are much smaller in size than an ordinary three-phase continuously rated transformer with the same rating and cheaper. One of these grounding transformers is zig-zag transformers.

Obtain the System Neutral with Wye-Delta Transformer

A wye-delta connected three-phase transformer or transformer bank can also be utilized for system grounding. The primary phase windings are connected to the phases of the system and the neutral point is connected directly or via a resistance to the ground. The delta connection must be closed to provide a path for the zero-sequence current, and the delta voltage rating is selected for any standard value. When a phase neutral fault occurs, the fault current is limited to the sum of the transformer leakage reactance and neutral resistance as the transformer has zero sequence in the primary Wye windings and the secondary delta is a closed series circuit.



GT

Obtain the System Neutral with Wye-Open Delta Transformer

In this application, the neutral side of the primary of the Wye open delta earthing transformer is directly connected to the ground. A limiting resistor is connected to the open ends of the open delta which is connected secondary windings. When a phase earth fault occurs in the system, this resistance limits the current in closed secondary delta windings. In this way, the fault current in the primary windings of the earthing transformer is also limited.

Technical Characteristics

- Nominal Voltage: up to 36 kV
- Nominal Fault Current: up to 3000 A
- Fault Duration: according to request (10,30,60 sec or others)
- Vector Groups: ZN (Zigzag), ZNyn, YNd(open), li0
- Cooling Types: AN, ONAN, ONAF
- Frequency: 50/60 Hz
- Installation: Indoor/Outdoor
- Enclosure with CT, VT and disconnector switch alternatives
- Applicable Standards: ANSI/IEEE Std 32, IEEE-C57.32, IEC 60076-6

Grounding Solutions

Generator Neutral & Leads Cubicles

B

3 phases from the LV and MV generator are combined inside the Generator Neutral Cubicles to provide a neutral point. This neutral point is connected to the ground through a resistor. The purpose of Neutral Grounding;

- Limit the ground fault current to prevent any damage to the generator and ensure operation continuity and safety
- Provide sensing the fault current with the relays by means of current transformer mounted inside the Neutral Grounding Resistor and limiting the fault duration.
- Send data to the relevant relays with phase current transformers connected to the three phases prior to the neutral point
- Limit oscillating and non-oscillating transient voltage caused by the interruption of the failure current and so protect the insulation level of system equipment
- Improve personnel safety by ensuring that the step voltage on the site is maintained at safety levels
- Prevent overheating and mechanical stress on the equipment subject to failure current

Phase-ground fault current of generators are generally limited to 5 A, 10 A or 20 A. Fault duration is generally set as 10 seconds. This can be up to 30 seconds at plants which do not have any tolerance to sudden power interruptions. At hospitals, data centers, textile plants, cement plants and other facilities that manufacture with injection, fault duration can be continuous unless the fault current do not damage the system to ensure continuity of system and determine the fault point without any power interruption. See "High-Resistance Neutral Grounding System" for detailed information.

The following basic parameters and a single-line scheme of the system, if possible, are required for preparing an offer for a generator neutral grounding resistor system.

Resistor Element:

- Spring-wound, edge-wound or grid resistor elements with a cross-section suitable for the nominal current
- Fully-modular, bended and stainless steel bolt connections in order to ensure electrical continuity at high temperature
- High conductivity for high current with bended and cascaded terminal connectors suitable for serial and/or parallel connections with high cross-section, low contact resistance
- High internal insulation and high mechanical resistance against shocks and sagging thanks to the use of large surface sated bushings and M16 shear connectors
- Special designed to dissipate the thermal and mechanical effects of overcurrent to the surface grid resistors
- Phase to phase and phase to neutral voltage of the generator which the resistor is connected
- Fault current level
- Fault duration
- Specifications of phase current transformers



GNH / GNC

Technical Specifications:

- Suitable up to 17.5 kV
- Applicable for fault currents up to 5000 A
- Stainless steel resistance material suitable for extreme ambient conditions, resistant to oxidation and corrosion, (AISI304, AISI310, AISI316, AISI430, CrAl, CrNi)
- Special mechanical and electrical design to withstand high temperature and extreme current values
- Internal current transformer detecting failure current
- Design and tests in accordance with ANSI/IEEE 32, IEC 62271-200 standard and special specifications

Enclosure:

- Standard IP20 Protection Level suitable for indoor usage and perfect cooling
- Enclosure with standard paint (RAL7035)
- Fully-modular, rigid, strong enclosure design with resistor blocks mounted to the frame for safety lifting from the upper or lower side
- Lockable door with hinges
- Stainless Steel product and warning labels

Options:

- Requested protection level from IP20 to IP56
- Hot-dipped galvanized, stainless steel, aluminum enclosure
- Painting enclosure in desired color code
- Entry from top or bottom with bushings
- Additional equipment including voltage transformer, surge arrester, panel heater, analog display etc.
- Special design for high altitude

Load Banks are used performance tests of generators, UPS, voltage regulators, power transformers, alternators and test laboratories and also ensure to operate the generators safely (dummy load). Aktif manufactures all type of load banks with the required;

- Characteristics (R, L, C)
- Electric characteristics (AC, DC, V, A, kW)
- Stage precision
- Control (manual, HMI-controlled or automatic)
- Measuring methods
- Installation (indoor or outdoor)
- Rack mounted, portable, stationary and trailer mounted alternatives

Applications

Load Banks are used in many industrial areas and applications. As energy needs become more and more important day by day, testing, protecting and maintaining the resources that provide this energy temporarily or continuously is becoming more and more important. Major usage areas of Load Banks are listed below:

- Testing whether the products such as power transformer, generator, alternator, UPS, regulator provide the design values and reporting the electrical values read or recorded during the test.
- Testing the generators, UPS or regulators after maintenance or repair on site or workshop.
- No-load operation of generators is not requested. In this case, automatically providing artificial load when the load supplied by a generator falls below a certain level (ideally 30%)
- Automatic damping of the regenerative power which is created when facilities where high-power motors are driven by regenerative drives are supplied by generators.
- Load dispatch test at power plants
- Testing of alternators used by military or civil air, road or marine vehicles
- Controlled discharge and capacity testing of batteries
- Electrical and heat simulation and performance tests of data centers with load banks
- Inverter performance tests



LBR
19", 6 kW 230 Vac



LB
2 MW, 400 V, 50 Hz

Technical Characteristics

Load Banks can be manufactured for AC (50/60/400 Hz) or DC and AG or OG operating voltages.

Load banks based on load characteristics;

- Resistive (kW-cosφ: 1)
- Inductive (kVAr)
- Resistive + Inductive + Capacitive (kVA-cosφ: requested)

Special designs can be made for different frequency and cosφ values.

AC Load Banks are designed in kW, kVAr or kVA and DC Load Banks are designed in Current (A).

Applicable Standards: IEC 60664-1, IEC 60529

Physical Properties

Load Banks can manufactured IP 20 protection level for indoor use, IP20 for outdoor use under shelter or IP 23 for outdoor use on open area.

There are two types of load banks according to cooling direction.

- horizontal air flow
- vertical air flow

Load Banks

B

Rack Mounted Data Center Load Banks

Datacenter Load Banks are known as Datacenter Simulators. These load banks shall be manufactured suitable for 19" Rack Cabinets. Aktif's Datacenter Load Banks are designed to simulate server operation as temperature rise of data hall and/or temperature rise time period during simulated failure of the cooling system. C13 or C14 power socket shall be used for power connections.

Portable and Stationary Load Banks

Load banks are manufactured portable and case-type up to 200 kW. Load banks up to 500 kW are manufactured with wheels.

Over than 500 kW load banks are usually fixed on the ground.

Trailer Mounted / Mobile Load Banks

Load banks can be installed on a trailer and transported by a vehicle on demand.



LBR-R1
19", 6 kW 48 Vdc



LBR-03 (N2 Model)
300 kW, 400 V, 50 Hz

Load Banks Control Types

"N0" (Without Control) Model

"N0" control model is used if the customer wants to control the load bank themselves. Load bank includes loads, fans, sensors and an empty control panel. The power cables of the loads, the supply of the fans and the contacts of the sensors are drawn into the terminals in the empty control panel.

"N1" (Simplest Control) Model

It is the simplest and cheapest control model. Each load phase is directly switched with miniature circuit breaker or cam switches. A wattmeter is used for measurement.

"N2" (Contactor Control) Model

Loads are protected with miniature circuit breakers or compact circuit breakers and switched with contactors. Load contactors are controlled with buttons and their indicators on the control panel.

The network analyzer on the control panel is used for measurement. This analyzer allows reading of kW, kVA, kVAR, A, V, f, $\cos\phi$... etc. Optionally, an analyzer with PC communication (RS212, RS458 or USB port) is used to monitor the measured values on the PC.

“N3” (HMI Control) Model

Loads are protected with miniature circuit breakers or compact circuit breakers and switched with contactors. Load contactors are controlled through the interface of touchscreen “TFT LCD HMI Panel”. HMI runs with a microprocessor-based electronic control board or in integration with the PLC and with a communicating network analyzer.

Operator can manually switch on all loads individually or all in one go via the HMI interface and can automatically control with many control options and scenario. In addition, kW, kVAr, kVA, A, V, f, cos ϕ , etc. are monitored on the HMI screen. These values can also be stored on the HMI's memory card. Loads can be switched on only when there is no safety issue. In addition, all errors are monitored on HMI screen.

“N4” (Computer Control) Model

Loads are protected with miniature circuit breakers or compact circuit breakers and switched with contactors. Load contactors are controlled through the computer software. Operator can manually switch on all loads individually or all in one go via the computer software and can automatically control with many control options and scenario. In addition, kW, kVAr, kVA, A, V, f, cos ϕ , etc. are monitored on computer software. These values can also be stored as an excel file in the computer and memory card.

Loads can be switched on only when there is no safety issue. In addition, all errors are monitored on computer software.



LBR-R5 (N2 Model)
500 kw, 400 V, 50 Hz



LBR-03 (N3 Model)
300 kw, 400 V, 50 Hz

“N5” (Automatic Control) Model

Loads are protected with miniature circuit breakers or compact circuit breakers and switched with contactors. Load contactors are controlled through the interface of touchscreen “TFT LCD HMI Panel”. HMI runs with a microprocessor-based electronic control board or in integration with the PLC and with a communicating network analyzer.

No-load operation of generators is not requested. In this case, Load Bank automatically provides artificial load by microprocessor-based electronic control board or PLC when the load supplied by a generator falls below a certain level (ideally 30%).

Loads can be switched on only when there is no safety issue. In addition, all errors are monitored on HMI screen.

Motor Control and Braking Resistors

Dynamic Braking Resistors

“Dynamic Braking Resistors” are used to ensure fast stopping or decrease the speed of AC and DC electric motors controlled by speed drives (speed control devices).

Aluminum Resistors

The resistor made of stainless steel wire is placed in an aluminum case with a larger surface which allows good heat dissipation. The space between the resistor and the case is filled with a material which have high thermal conductivity and electrical insulation. Resistors manufactured using this technology can be used as braking resistors or capacitor discharge resistors, constant load tester, wind power plants, hybrid vehicles and other industrial applications.

As standard aluminum resistors are manufactured with 1 meter length fiber glass braided silicone cable, suitable to rated current and connections resistant to high temperature. They can be manufactured with connectors or terminals on request.

Technical Characteristics

Maximum operating voltage	: 1000 V
Resistance tolerance @ 20°C	: ± 5%
Protection class	: IP5X (Indoor only)
Insulation	: 2 kV, 50/60Hz, 1 min
Applicable Standard	: IEC 60664-1, IEC 60529



BRA Series Aluminum Resistors

Frame Resistors

As the name states, Frame Resistors are resistors mounted inside an enclosure where resistor elements are positioned in open space environment. It is possible to connect resistors in serial or parallel according to the requirements. Besides the connection type wire cross-section or grid size are calculated by an engineering software to perfectly fit the application.

Frame resistors types are defined according to the type of resistor design used in the enclosure. Different series are defined as:

Resistor Type	Our Indication
Spring Wound Resistor	S Series
Edge Wound Resistor	E Series
Grid Resistor	G Series

The Frame Resistors can be manufactured to be used in outdoor applications as well as indoor applications when the frame is manufactured accordingly.

Galvanized steel is used for indoor type frame resistor and stainless steel is used for outdoor type frame resistor. Stainless steel provides higher corrosion resistance and lifetime than painted frames.

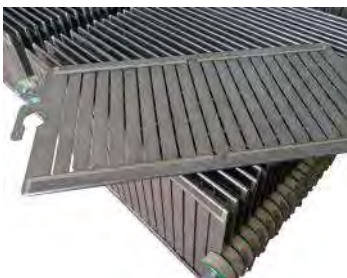
All S, E and G series frame resistors can be manufactured either as indoor or outdoor type.



Spring Wound Resistor Element



Edge Wound Resistor Element



Grid Resistor Element

Motor Control and Braking Resistors

Dynamic Braking Resistors

Spring Wound Resistors

Spring wound (wire wound) resistor elements are used inside S series frame resistors. This type is perfectly suitable for short-time overloads due to its spiral form. Heated wire absorbs any expansion thanks to spiral form and gets back to its colder form. With this feature, the spring resistor ensures safety and a long operating life for especially the braking resistors.

Technical Characteristics

Maximum operating voltage	: 1000 V
Resistance tolerance @ 20°C	: ± 5%
Protection class	(Indoor) : IP20 (Outdoor) : IP23
Insulation:	: 3 kV, 50/60Hz, 1 min
Frame Material	(Indoor) : Galvanized steel (Outdoor) : Stainless steel
Applicable Standard	: IEC 60664-1, IEC 60529



BRS-D01b



BRE-D28n



BRG-D04a



BRG-H02a

Edge Wound Resistors

Edge Wound Resistors are used for E-series frame resistors. In Edge Wound Resistor type, the resistor element is in the form of stainless steel stripe plate. This stripe plate is wound on an electro-ceramic frame vertically. Large cross-section and the capability of fast cooling offer an optimal solution for high power - low resistance braking resistors.

Technical Characteristics

Maximum operating voltage	: 1000 V
Resistance tolerance @ 20°C	: ± 5%
Protection class	(Indoor) : IP20 (Outdoor) : IP23
Insulation	: 3 kV, 50/60Hz, 1 min
Frame material	(Indoor) : Galvanized steel (Outdoor) : Stainless steel

Grid Resistors

G series braking resistors are manufactured in blocks by connecting in serial or in parallel with the desired power and resistance value by the stainless steel grid type resistors specially designed according to the desired current density. They are generally used for high power and low resistance applications.

Technical Characteristics

Maximum operating voltage	: 1000 V
Resistance tolerance @ 20°C	: ± 5%
Protection class	(Indoor) : IP20 (Outdoor) : IP23
Insulation	: 3 kV, 50/60Hz, 1 min
Frame material	(Indoor) : Galvanized steel (Outdoor) : Stainless steel

Motor Control and Braking Resistors

Motor Starting Resistor

Motor Starting Resistors

All kind of motors used in the industry draw high current (up to 6-12 times) until the they reach rated speed and rated torque if they are connected to the load. Such overcurrent may damage the engine as well as other system equipment. Motor starting resistors limit overcurrent and help the motor to reach the nominal speed in stages without drawing too high current.

With developing speed drives, motors can be started and controlled as requested. Aktif can design, manufacture and support the suitable motor starting resistor in terms of spare parts and replacements for current systems.

Motor starting resistors can be classified in two groups;

Stator Resistors:

Serial connected and staged resistors are connected to the motor entry (stator side) of squirrel-cage asynchronous motor and DC motors to reduce the input voltage and resistors are switched off in stages through contactors to decrease the motor input voltage and balance the torque speed.

Rotor Resistors:

Serial connected and staged resistors are connected to the rotor of a slip ring wound rotor asynchronous motors to increase the motor impedance. Resistors are switched off in stages through contactors to decrease the rotor impedance in stages and balance the torque speed.

Motor starting resistors are used in the following applications;

- Steel industry
- Mining
- Cement plants and other heavy industry,
- Rolling, conveyor, lifting, breaking, mixing and pumping applications

The following basic parameters are required for making an offer for a motor starting resistor.

For slip ring wound rotor asynchronous motors;

- Motor power (kW / Hp)
- Rotor Voltage (V)
- Rotor Current (A)
- Rotor rpm (nr)
- Connection (star/delta)
- Self winding resistance, if known
- Requested number of stages
- Starting time in case of a starting resistor



MYD

For DC motors

- Motor votlage (V)
- Motor current (A)
- Starting current, if requested (A)
- Self winding resistance, if known
- Requested number of stages
- Starting time in case of a starting resistor

Resistor Element:

- Spring-wound, edge-wound or grid resistor elements with a suitable cross-section
- Fully-modular, bended and stainless steel bolt connections in order to ensure electrical continuity at high temperature
- High conductivity for high current with bended and cascaded terminal connectors suitable for serial and/or parallel connections with high cross-section, low contact resistance
- High internal insulation and high mechanical resistance against shocks and sagging thanks to the use of large surface satiated bushings and M16 shear connectors

Enclosure:

- Standard IP23 Protection Level suitable for outdoor usage or IP20 suitable for indoor usage and perfect cooling
- Standard hot-dipped galvanized sheet steel
- Fully-modular, rigid, strong enclosure design with resistor blocks mounted to the frame for safety lifting from the upper or lower side
- Easy access and maintenance to the resistor blocks on site thanks to blocks independently mounted to the frame
- Corrosion-resistant handling rings and connectors
- Stainless steel product and warning label

Harmonic Filter Resistors

Use of power electronic equipment (HVDC, SVC etc.) with technological developments and non-linear loads such as arc and induction ovens have caused to the harmonics (magnitudes different than the network frequency) and have decreased the power quality.

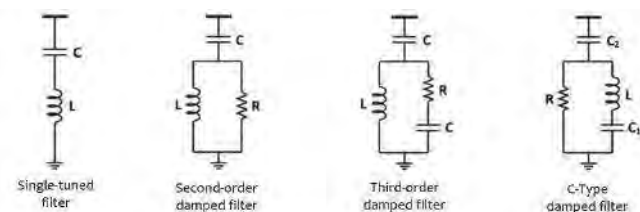
This issue affects other linear loads which do not cause harmonics and cause overheating, insulation problems, short operating life and significant loss of efficiency. Harmonics do not result in any benefits but cause significant power losses at the network.

Passive harmonic filtration is the most efficient and cost-effective method to eliminate harmonics. The harmonic filter systems can only consist of capacitor and reactor (LC) in principle. However, in this case, a change in the value of the capacitor or reactor due to manufacturing defect, aging or temperature can affect the filtering severely and may cause the parallel resonance to increase even more harmonics. This sensitivity can be controlled by adding resistance to the filter circuit and the harmonic filter system so that it can continue to work with the same efficiency for a long time.

For low-voltage systems, harmonic filtering with a capacitor and a reactor is a more optimal solution due to low risk. However, considering the risk of changing the capacitance of the capacitor and the damage that may occur using harmonic filter resistance is a more optimum solution in medium voltage and high voltage systems.

Technical Characteristics

- Suitable up to 36 kV rated voltage
- Stainless steel resistance material suitable for extreme ambient conditions, resistant to oxidation and corrosion, low resistance variation against to temperature and low inductance
- Special mechanical and electrical design to withstand high temperature and inrush current
- Design and tests in accordance with IEC 60071-1 and CIGRE WG 14.30 Section 17 Resistors and other special specifications
- Insulated from ground and suitable for the isolation level between the input terminal and the ground, between the output terminal and the ground and between the input and output terminals



DR

Resistor Element

- Spring-wound, edge-wound or grid resistor elements with low inductance and a cross-section suitable for the nominal current
- Fully-modular, bended and stainless steel bolt connections in order to ensure electrical continuity at high temperature
- High conductivity for high current with bended and cascaded terminal connectors suitable for serial and/or parallel connections with high cross-section, low contact resistance
- High internal insulation and high mechanical resistance against shocks and sagging thanks the use of large surface saturated bushings and M16 shear connectors
- Special designed to dissipate the thermal and mechanical effects of overcurrent to the surface grid resistors

Enclosure

- Standard IP23 Protection Level suitable for outdoor usage and perfect cooling
- Standard hot-dipped galvanized steel
- Frame suitable for side by side (horizontal) or stacked (vertical) installation
- Side or top entry or exit with bushings based on insulation level
- Fully-modular, rigid, strong enclosure design with resistor blocks mounted to the frame for safety lifting from the upper or lower side
- Easy access and maintenance to the resistor blocks on site thanks to blocks independently mounted to the frame
- Corrosion-resistant handling rings and connectors
- Stainless steel product and warning labels

Filter Resistors

RC Snubbers Filters

Voltage sags and swells occur on the electric network while switching inductive loads such as shunt reactors, power transformers and high-power motors and during operation of arc furnaces which work with the principle of short circuit. Voltage protection relays detect voltage sags and swells as a failure and may disable the load in an uncontrolled manner. Voltage sags and swells may also cause stress on the load insulation on the electric network, loss of operating life and even serious damages.

In order to attenuate the transient voltage that occur during the commissioning of such loads of inductive character, the snubber capacitor which do not allow sudden changes in the voltage and the series-dependent damping resistance are used.

RC snubber filters are connected parallel to the network as close as possible to the load causing transient voltage. During the transient voltages occurring at high frequencies, the RC filters' impedance decreases to low value, prevent over-voltage of the mains voltage and damp the oscillation very soon.

Technical Specifications:

- Suitable up to 36 kV
- Stainless steel resistance material suitable for extreme ambient conditions, resistant to oxidation and corrosion low resistance variation against temperature and low inductance
- Special mechanical and electrical design to withstand high temperature and inrush current
- Design and tests in accordance with IEC 60071-1 and other special specifications

Resistor Element:

- Spring-wound, edge-wound or grid resistor elements with low inductance and a cross-section suitable for the nominal current
- Fully-modular, bended and stainless steel bolt connections in order to ensure electrical continuity at high temperature
- High conductivity for high current with bended and cascaded terminal connectors suitable for serial and/ or parallel connections with high cross-section, low contact resistance
- High internal insulation and high mechanical resistance against to shocks and sagging thanks to the use of large surface sated bushings and M16 shear connectors
- Special designed to dissipate the thermal and mechanical effects of overcurrent to the surface grid resistors



Enclosure:

- Standard IP23 Protection Level suitable for outdoor usage and perfect cooling
- Standard hot-dipped galvanized steel
- Fully-modular, rigid, strong enclosure design with resistor blocks mounted to the frame for safety lifting from the upper or lower side
- Easy access and maintenance to the resistor blocks on site thanks to blocks independently mounted to the frame
- Door with hinges and lock
- Corrosion-resistant handling rings and connectors
- Stainless steel product and warning labels

Options:

- Requested inductance limits
- Stainless steel, aluminum enclosure
- Painting enclosure in desired color code
- Top or bottom entry or exit with bushings
- Modular elevation legs suitable for extreme environmental conditions
- Special design for high altitude

Filter Resistors

Current Limiting Resistors

Current limiting resistors are used to reduce the transient current and to adjust the test current to the desired value at power laboratories and some special applications.

Current limiting resistors are especially designed and manufactured according to their intended purpose.

Technical Specifications:

- Stainless steel resistance material suitable for extreme ambient conditions, resistant to oxidation and corrosion
- Low resistance variation against temperature and low inductance
- Special mechanical and electrical design to withstand high temperature and inrush current
- Design and tests in accordance with relevant standards and other special specifications

Resistor Element:

- Spring-wound, edge-wound or grid resistor elements with low inductance and a cross-section suitable for the nominal current
- Fully-modular, bended and stainless steel bolt connections in order to ensure electrical continuity at high temperature
- High conductivity for high current with bended and cascaded terminal connectors suitable for serial and/or parallel connections with high cross-section, low contact resistance
- High internal insulation and high mechanical resistance against shocks and sagging thanks to the use of large surface saturated bushings and M16 shear connectors
- Special designed to dissipate the thermal and mechanical effects of overcurrent to the surface grid resistors



Enclosure:

- Standard IP23 Protection Level suitable for outdoor usage and perfect cooling
- Standard hot-dipped galvanized steel
- Frame suitable for side by side (horizontal) or stacked (vertical) installation
- Side or top entry or exit with bushings based on insulation level
- Fully-modular, rigid, strong enclosure design with resistor blocks mounted to the frame for safety lifting from the upper or lower side
- Easy access and maintenance to the resistor blocks on site thanks to blocks independently mounted to the frame
- Corrosion-resistant handling rings and connectors
- Stainless steel product and warning labels

Options:

- Requested protection level from IP00 to IP55
- Requested inductance limits
- Stainless steel, aluminum enclosure
- Painting enclosure in desired color code
- Side or top entry or exit with bushings
- Modular elevation legs suitable for extreme environmental conditions
- Special design for high altitude

Filter Resistors

Ferroresonance (Damping) Resistor

Ferroresonance is a nonlinear resonance phenomenon that affects power networks. Circuit must contain at least below circuit elements as it can be defined as ferroresonance:

- Non-linear saturable inductance (ex; transformer)
- Capacitor
- Resistor

In a circuit consists of these elements; by changing the values of an electrical component, the values of current and voltage values on the terminals at other components change suddenly.

Ferroresonance begins some switching events such as; load rejection, energizing or de-energizing of transformer, switching of circuit breaker. The causes risk to it can be listed as follows:

- Idling or operation on low load on the systems grounded neutral point
- Insulation faults,
- Overloading or idling of voltage transformer
- Switching one or two phases
- Dissymmetry caused by connection errors
- Switching transformers or capacitors
- Connecting low load power transformers to network with short circuit load
- Long and / or capacitive cable feeding a transformer
- Streak of lightning on transmission lines

When the ferroresonance occurs some of the below symptoms are accompanied:

- Phase-to-phase or phase-to-neutral long-term over voltages
- Long - term overcurrents
- Distortion on the current and voltage waveforms
- Displacement of the neutral point voltage
- Transformer overheating (at no load)
- Load noise in voltage transformers and overheating in core and primary windings
- The failures cause of thermal effect or insulation breakdown on electrical materials (capacitor banks, current - voltage transformers etc.)

Ferroresonance On The Voltage Transformers

A good example about VT destruction by ferroresonance is that the primary winding is destroyed and secondary winding remains intact.

However, all of these symptoms are not specific to the ferroresonance. For example; displacement of the neutral point may be the consequence of a single phase to earth fault an unearthed neutral system.

Voltage transformers can be into two different types as inductive and capacitive. Inductive voltage transformers are more prone to ferroresonance. Because, they have more inductive characters and so they need more capacitance to convert ferroresonance circuit.



FR

In ferromagnetic circuits which wirings of ferromagnetic materials such as iron, ferroresonance occurs because of the inductance. Transformers are an excellent example of ferromagnetic inductance.

Preventing Ferroresonance On Voltage Transformers

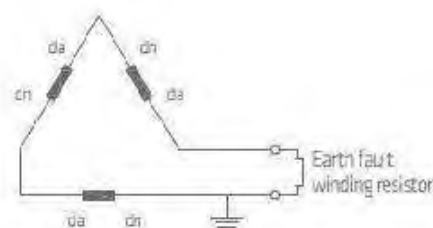
When the single pole inductive voltage transformer is used, keep in mind that ferroresonance can be occurred if the circuit closes or in the process of earthing fault damping.

Ferroresonance may cause to overheating of voltage transformers and accordingly damage or over induction. It can be damped only by lowering the voltage or connecting a fixed ohmic resistance.

Although predicting when the ferroresonance might occur, its risk can be preventing or reducing by taking precautions in advance.

There are some preventive measures for ferroresonance. However, the most practical and the most economical method is using ohmic resistance with open-delta winding on voltage transformers' secondary windings.

When the voltage transformers' protection windings are used as circuit in Figure-1 (a fixed ohmic resistor is connected to ends of open-delta connection) third harmonic currents flow and thus the resonance is prevented. The advantage of this resistor doesn't affect measurement precision and doesn't cause any loss under normal operation conditions. Open-delta circuit should be grounded from only one point shown as Figure-1. Resistor damps only unbalanced situations. On balanced situations, there is no current flow at open- delta circuit.



Open delta connection circuit

Filter Resistors

Discharge Resistors

Discharge resistors are used to discharge the capacitors and batteries. Discharging the capacitors and batteries may be compulsory for maintenance. Discharging may be for safety reasons or in order to do load testing at power laboratories and some special applications.

Discharge resistors are especially designed and manufactured according to their intended purpose.

Technical Specifications:

- Stainless steel resistance material suitable for extreme ambient conditions, resistant to oxidation and corrosion, low resistance variation against temperature and low inductance
- Special mechanical and electrical design to withstand high temperature and inrush current
- Design and tests in accordance with relevant standards and other special specifications

Resistor Element:

- Spring-wound, edge-wound or grid resistor elements with low inductance and a cross-section suitable for the nominal current
- Fully-modular, banded and stainless steel bolt connections in order to ensure electrical continuity at high temperature
- High conductivity for high current with banded and cascaded terminal connectors suitable for serial and/or parallel connections with high cross-section, low contact resistance
- High internal insulation and high mechanical resistance against to shocks and sagging thanks to the use of large surface sated bushings and M16 shear connectors
- Special designed to dissipate the thermal and mechanical effects of overcurrent to the surface grid resistors

Enclosure:

- Standard IP23 Protection Level suitable for outdoor usage and perfect cooling
- Standard hot-dipped galvanized steel
- Frame suitable for side by side (horizontal) or stacked (vertical) installation
- Side or top entry or exit with bushings based on insulation level
- Fully-modular, rigid, strong enclosure design with resistor blocks mounted to the frame for safety lifting from the upper or lower side
- Easy access and maintenance to the resistor blocks on site thanks to blocks independently mounted to the frame
- Corrosion-resistant handling rings and connectors
- Stainless steel product and warning labels



Options:

- Requested protection level from IP00 to IP55
- Requested inductance limits
- Stainless steel, aluminum enclosure
- Painting enclosure in desired color code
- Side or top entry or exit with bushings
- Modular elevation legs suitable for extreme environmental conditions
- Special design for high altitude

Anti-Condensation Heaters

B

Climatic properties such as the air temperature and humidity in the environment where the electrical cubicles are installed are very important for the continuity of the system and the safety of the personnel.

The amount of water in the air is called moisture. As the temperature increases, the amount of water in the unit air increases. Sudden decreases in air temperature cause some of the moisture in it to become water, which is called a dew point. The water formed with the beginning of the condensation is distributed to the surfaces inside the electrical cubicle in the form of tiny droplets. This situation poses great risks in M.V. switchgears. These water drops are spread over board cubicles, insulators, MV circuit breakers, and other electrical equipment to reduce safe creepage distances to dangerous values. This may result in partial discharges or direct insulation fault (discharges).

The way to eliminate this risk is to use an anti-condensation heater.

Technical Specifications:

- Resistance Element: Wire wound, high efficiency
- Cartridge Resistance
- Frame Profile: High cooling surface aluminum
- Insulation: 2 kV 50/60 Hz 1 min.
- Protection Degree: IP 20
- Applicable Standard: IEC 60664-1

Advantages:

- The most efficient body surface area that can be used in the environment heating are increased extrusion and anodized aluminum. Aktif heaters' frames have 120% more surface efficiency than stainless pipe heaters.
- MGO powder is used for insulation material. The heaters have an insulation level of 2kV 1 min. In addition, this powder increases the mechanical strength and vibration resistance of the heater.
- As the resistance element is stainless and has very low temperature coefficient been used, the power of the heater does not reduce during operation. PTC heaters cannot prevent condensation as their power significantly reduce while operating.
- Aktif heaters offer the best solution as moisture reduction performance. It is 60% more efficient than pipe heaters and 670% more than PTC heaters.
- The distribution of heat inside the cubicle is important for the Anti-Condensation Heaters in order to perform its task homogeneously. Heat dissipation at different points of the cubicle is max. 20 °C for Aktif heaters.
- The moisture reduction rate of the Anti-Condensation Heaters shall be equivalent to the temperature falling rate.



PR

Usage Guidelines for Anti-Condensation Heaters:

- One or more Anti-Condensation Heaters and a separate thermostat (if used) shall be used for each medium voltage cubicle.
- The thermostat shall not be used or shall set for a very large limit.
- Anti-Condensation Heaters shall be manufactured by wire winding resistance inside high cooling surface aluminum frame.
- Under normal conditions, 100 W per m³ Aktif heater (winding resistance inside high cooling surface aluminum frame) is enough. In a 2 m³ cubicle, a 100 W Aktif heater can achieve a 12% reduction in 1 hour. If this cubicle is used in a place where the humidity reaches 95% values, it is correct to increase the heater power to 150 W. In this case, the power of the heater for each cubicle shall be determined by considering the site conditions and cubicle volume.
- Anti-Condensation Heaters shall be mounted on the bottom of the cubicle at a maximum height of 20 cm from the floor due to the rise of the heated air and generally the humidity ingress from the bottom.
- The active heating surfaces of the Anti-Condensation Heaters shall be mounted so that they do not touch the cubicle construction. Because the high surface area construction reduces the temperature of the heater surface by contact, it significantly reduces the efficiency.
- In order to prevent to be switched off for any reason, a control can be established to monitor the heater circuit.
- Since the Anti-Condensation Heater surface temperature is high, it must be installed at a minimum distance of 10 cm from the materials to be affected by the temperature.
- A common misconception is that the heater is installed in the cubicle and the thermostat is installed in the LV cabinet. Since the thermodynamic values between these two environments are different, the thermostat and the heater shall be in the same environment.

Power Quality & Power Factor Correction C

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Power Quality & Power Factor Correction



Energy



Industry



Building



Renewable Energy



Power Quality Engineering

Power quality engineering is an application of measuring electrical system with proper equipment in conformity with related international standards and generating site analyzes reports by expert engineers who must be competent in in Power Quality.

The right method of measurements is capturing all parameters at the correct measuring points with appropriate periods and sampling sensitivity according to EN 50160, IEC 61000-4-7, IEC 61000-4-15 and IEC 61000-4-30 standards.

Aktif has been providing power quality services like measuring, analyzing, reporting, solution providing, designing, manufacturing, commissioning and consultancy at any level of electricity since 1996.

Advantages

- Analyzing electrical network and determining the problems
- Designing best solutions according to measurement data and analysis
- Providing most economic solutions
- Preventing of reactive penalties
- Removing of energy losses
- Allowing more effective usage of the transformer.
- Increasing the life of electrical equipment like transformer, motors, switches, etc

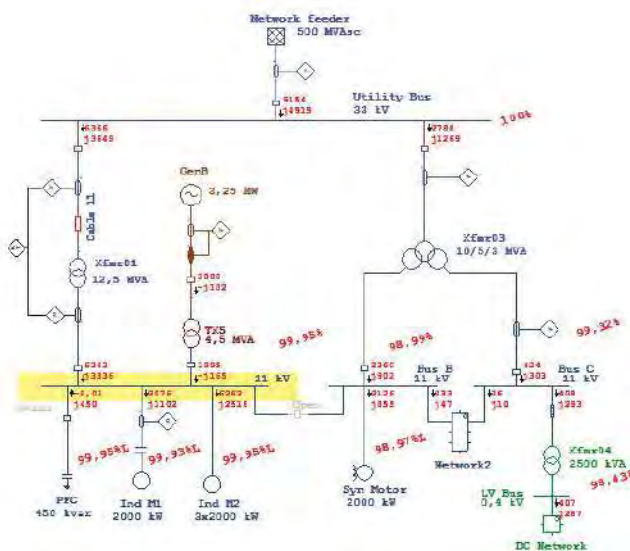


The following data should be recorded during the measurement;

- Voltage Sag
- Voltage Swell
- Voltage Interruption
- Voltage Unbalance
- Power Frequency
- Flicker – Pst, Plt
- Notch
- Transient
- Harmonics

In addition to above measurements, the following data should be recorded during measurement of:

- Voltage Measurements
Vrms, Vr, Vs, Vt, Vo, Vpoz, Vneg
- Current Measurements
Irms, Ir, Is, It, Io, Ipoz, Ineg
- Crest Factor Measurements
CF-Vr, CF-Vs, CF-Vt
CF-Ir, CF-Is, CF-It



Power Flow and Harmonic Simulation



Nominal Power (50 / 60 Hz)		Model / Reference	Dimensions (a x b)
5 kVAr @525 V	3,12 kVAr @415 V	LTC-3P-5k-525V	55 mm x 200 mm
10 kVAr @525 V	6,25 kVAr @415 V	LTC-3P-10k-525V	75 mm x 210 mm
20 kVAr @525 V	12,50 kVAr @415 V	LTC-3P-20k-525V	100 mm x 240 mm
40 kVAr @525 V	25 kVAr @415 V	LTC-3P-40k-525V	120 mm x 240 mm

Technical Specification	
Over voltage	1.10 U _N /8 h daily, 1.15 U _N /30 min daily, 1.30 U _N /1 min daily
Over current	1.3 x I _N
Inrush current	200 x I _N
Losses	≤ 0.25 W/kVAr (without discahge resistor)
Tolerance	±5%
Test Voltage (Terminal/Terminal)	2.15 U _N , 10 sec
Test Voltage (Terminal/Case)	U _N ≤ 600V : 3000 V _{ac} /10 sec, U _N > 660 V _{ac} : 6000 V _{ac} /10 sec
Useful Life	150.000 hours
Temperature	-25 ... +55°C
Cooling	Natural or forced
Humidity	Max 95%
Altitude	≤ 1000 m
Mounting	Vertical/Horizontal
Install	M12 mm stud on bottom of case
Safety	New dry technology, self-healing, overpressure and over current disconnecter protection
Discharge	External type discharge resistor is included
Case	Extruded aluminium
Protection	IP20
Dielectric	Metallized polypropylene film
Standard	IEC 60831-12 VDO0560-46 47 GB12747-91 CF

Harmonic Filter Reactors

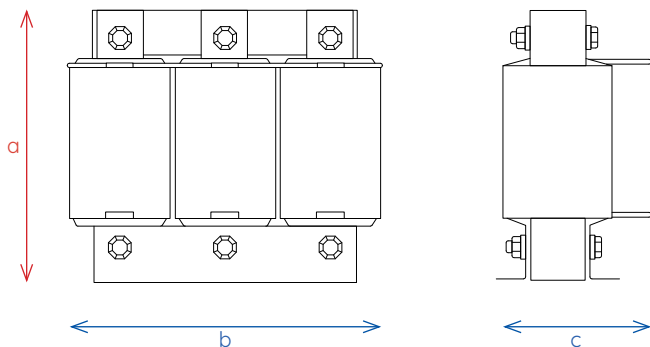
Asset AR series low voltage harmonic filter reactors are used in the high level of harmonic distortion in facilities for compensating of reactive power and protecting of capacitors. Which is the main staff in compensation systems and annihilating other negative effects. AR series harmonic filter reactors are manufactured as single phase and three phase. AR series reactors have 3 poles and 6 poles options. Furthermore, reactors have aluminum and copper coil options.

Advantages

- Manufactured according to customer's request
- Aluminum and copper coil options
- Easy mounting to different type of panels
- High quality and long life period



AR



Technical Characteristics

- Rated Voltages : up to 1000 V_{ac}
- Rated Frequency : 50/60 Hz
- Resonance Frequency : 132 ... 235 Hz
- Degree of protection : IP 00
- Power Range : up to 150 kVAr
- Over Voltage : 1.1 x U_n
- Inductance Tolerance : Max %3
- Temperature Class : F Class
- Standards : EN 61558-1, EN 60076-6, VDE 0550
- Loss Factor : < %1 x Q_n

Reactor Power		Model / Reference	(%p)	Dimensions a x b x c	Weight (kg)	Capacitor to be used together
5 kVAr @525 V	3,13 kVAr @400 V	AR-3P-5K-525V	7	142 x 120 x 110 mm	4,2	1 pc LTC-3P-5K-525V
10 kVAr @525 V	6,25 kVAr @400 V	AR-3P-10K-525V	7	176 x 180 x 117 mm	6,2	1 pc LTC-3P-10K-525V
20 kVAr @525 V	12,5 kVAr @400 V	AR-3P-20K-525V	7	205 x 240 x 110 mm	11,5	1 pc LTC-3P-20K-525V
40 kVAr @525 V	25 kVAr @400 V	AR-3P-40K-525V	7	205 x 240 x 130 mm	17,3	1 pc LTC-3P-40K-525V
80 kVAr @525 V	50 kVAr @400 V	AR-3P-80K-525V	7	255 x 300 x 141 mm	25,9	2 pcs LTC-3P-40K-525V
120 kVAr @525 V	75 kVAr @400 V	AR-3P-120K-525V	7	305 x 339 x 179 mm	46,4	3 pcs LTC-3P-40K-525V

Above reactors are our standard models suitable with our LTC capacitors. Please contact for any specific request.

Shunt Reactors

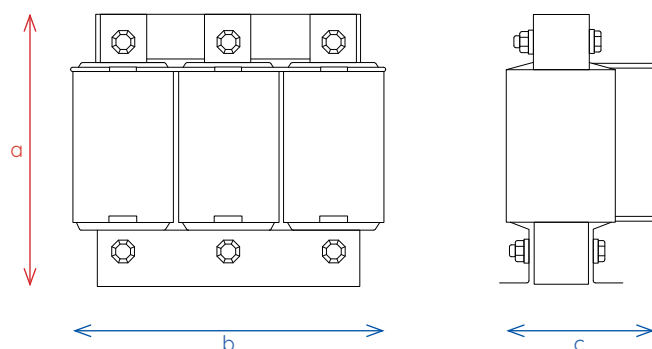
SR series shunt reactors have been used to compensate capacitive reactive power generated by long and unloaded transmission / distribution lines, thus allowing the flow of more active power through the system and avoiding penalties resulting from increasing of capacitive reactive power / active power ratio. These shunt reactors are the most effective method of compensating capacitive reactive power.

Advantages

- Manufactured according to customer's request
- Aluminum and copper coil options
- Easy mounting to different type of panels
- High quality and long life period



SR



Technical Characteristics

- Rated Voltage : up to 1000 Vac
- Rated Frequency : 50/60 Hz
- Degree of protection : IP 00
- Power Range : up to 50 kVAr
- Over Voltage : $1.1 \times U_n$
- Inductance Tolerance : Max 5%
- Temperature Class : F Class
- Rated Ambient Temperature : to 40 °C
- Standards : EN 61558-1, EN 60076-6
- Loss Factor : $< \%1 \times Q_n$

Power	Reference	Dimensions a x b x c	Weight (kg)
1 kVAr @400 V	SR-3P-1K-400V	240 x 220 x 175 mm	6,6
2,5 kVAr @400 V	SR-3P-2K-400V	240 x 220 x 175 mm	11,7
5 kVAr @400 V	SR-3P-5K-400V	300 x 280 x 220 mm	21,5
10 kVAr @400 V	SR-3P-10K-400V	360 x 260 x 250 mm	37,7
25 kVAr @400 V	SR-3P-25K-400V	480 x 360 x 215 mm	92
50 kVAr @400 V	SR-3P-50K-400V	540 x 315 x 550 mm	181

Above reactors are our standard models. Please contact for specific request.

Thymod Series Static Electronic Switches

Asset Thymod series Static Electronic contactors are the electronic switching units that used for the capacitor banks without any discharge delay in the plants where switching the capacitor banks according to load variation cannot be possible and change load variation fast.

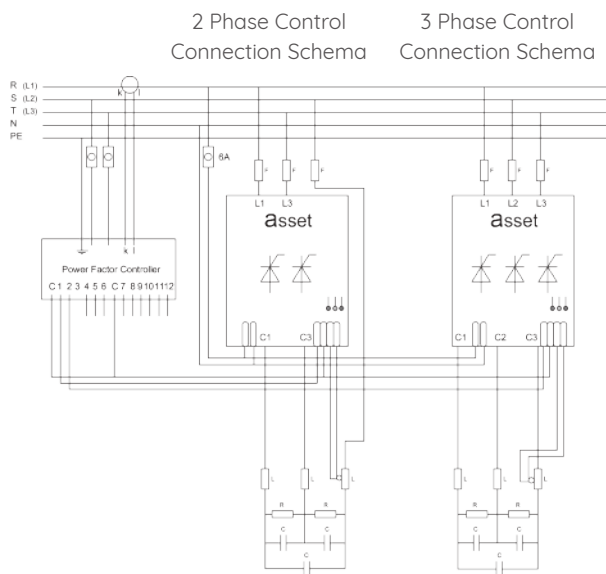
ThyMod series static electronic contactors have been developed according to the related IEC standards to balance the reactive power and solve the energy quality problems in complex industrial plants where used devices that are sensitive to voltage changes such as PLCs, industrial computers, industrial robots, welding machines.

Advantages

- Ultra-rapid power factor compensation
- Zero crossing technology
- Transient free switching
- Silent capacitor switching
- No need to wait for discharge time before re-switching
- Theoretically unlimited number of switching operations
- Modular and compact standardized design
- Easy to install and replace
- Long life time
- Power steps up to 100 kVar
- Direct connection up to 480 V



Thymod



Technical Characteristics

- Rated Voltage : 400 V AC
- Max. Operation Voltage : 480 V AC
- Rated Frequency : 50 / 60 Hz
- Rated Current : Up to 160 A
- Response time : < 40 ms
- Degree of protection : IP 20
- Operation Temperature : -10 °C / + 55 °C
- Type of Semiconductor : Thyristor – Thyristor Module
- Mass : 6100 g
- Dimensions (WxDxL) : 125 x 225 x 240 mm
- Mounting : Vertical Mounting to Mounting Base
- Standards : EN 60429-1, IEC 60439-1, IEC 60439-2

Product Range		
Model	Connection Type	Maximum power at 400 V
Thymod-25400-3P2	2 phase	25 kVar
Thymod-50400-3P2	2 phase	50 kVar
Thymod-100400-3P2	2 phase	100 kVar
Thymod- 25400-3P3	3 phase	25 kVar
Thymod-50400-3P3	3 phase	50 kVar
Thymod-100400-3P6	3 phase	100 kVar

Rack Units

Units C5 Compensation Rack

C5 series compensation racks provide customers different power level options thanks to its modular design. This modular design provides rapid and effective solution during installation, maintenance and system development period.

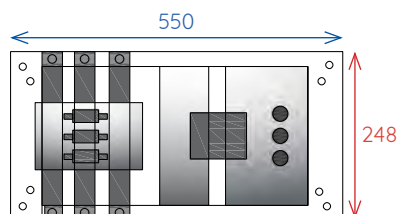
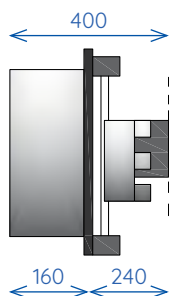
Production and test periods of C5 series compensation racks comply with International IEC standards. Racks are ready to use and there is no need to add any extra component. Electrical safety of plant is guaranteed thanks to its resistance to voltage and current rise.

C5 series compensation racks are suitable to install all kind of panels, save labor and time, have possibility to increase power by additional racks thanks to its modular design.



C5

Dimensions of C5 Rack



Advantages

- Reduce the labor cost with its fast and easy installation
- Allow fast production and delivery
- Secured against touching
- Allow maintenance from the front
- Reduce the maintenance cost
- Long life by using of LTC series capacitors
- No additional material is required

Technical Characteristics

- Rated Voltage : 380 ... 525V
- Nominal Frequency : 50 / 60 Hz
- Environment Temperature : -10 ... +45 °C
- Switching : Contactors

Power (50/60 Hz)		Model / Reference	Weight (kg)
5 kVAr @525 V	3.125 kVAr @400/415 V	C5-3P-5k-525V	4
10 kVAr @525 V	6.25 kVAr @400/415 V	C5-3P-10k-525V	5
20 kVAr @525 V	12.5 kVAr @400/415 V	C5-3P-20k-525V	6
40 kVAr @525 V	25 kVAr @400/415 V	C5-3P-40k-525V	9
80 kVAr @525 V	50 kVAr @400/415 V	C5-3P-80k-525V	16
2 x 80 kVAr @525 V	2 x 50 kVAr @400/415 V	C5-3P-160k-525V	24

Above types are our standard models. Please contact for specific request.

Rack Units

C7 Rack Units with Detuned Reactor

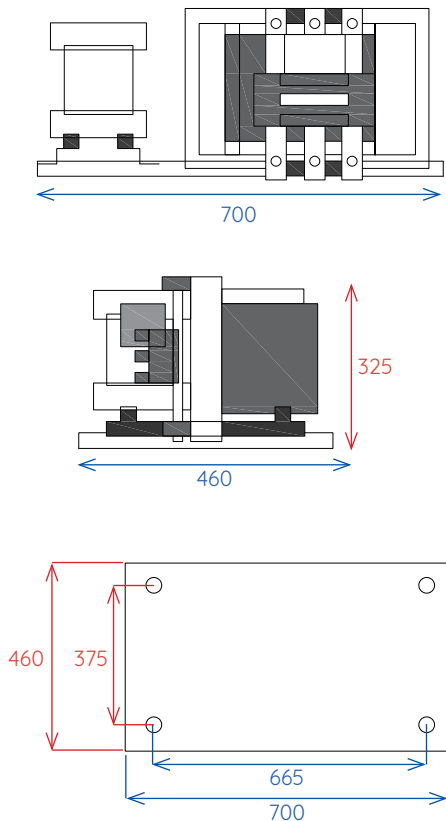
C7 series compensation racks provide to customers different power level option thanks to its modular design. This modular design provides rapid and effective solutions in installation, maintenance and system development period.

For the capacitors to be protected against harmonics, harmonic filter reactors are connected to the capacitors in serie and protect them against the dangerous harmonic current flows. Electrical safety of plant is guaranted thanks to its resistance to voltage and current rise.



Dimensions of C7s Rack

C7



Advantages

- It helps us in installation and maintenance period thanks to its modular design
- Asset LTC series capacitors
- No additional material is required
- Compensation rack has harmonic filter reactor which protects capacitor from the harmonics.

Technical Characteristics

- Rated Voltage : 380 ... 525 V
- Nominal Frequency : 50/60 Hz
- Resonance Frequency : 132 ... 235 Hz
- Switching : Contactors

Power (50/60 Hz)		Model / Reference	Weight (kg)
5 kVAr @525 V	3.125 kVAr @400 V	C7-3P-5k-525V	15
10 kVAr @525 V	6.25 kVAr @400 V	C7-3P-10k-525V	20
20 kVAr @525 V	12.5 kVAr @400 V	C7-3P-20k-525V	30
40 kVAr @525 V	25 kVAr @400 V	C7-3P-40k-525V	35
80 kVAr @525 V	50 kVAr @400 V	C7-3P-80k-525V	50
120 kVAr @525 V	75 kVAr @400 V	C7-3P-120k-525V	80

Above types are our standard models. Please contact for specific request.

Compensation Rack Units

C7s Static Rack Units with Detuned Reactor

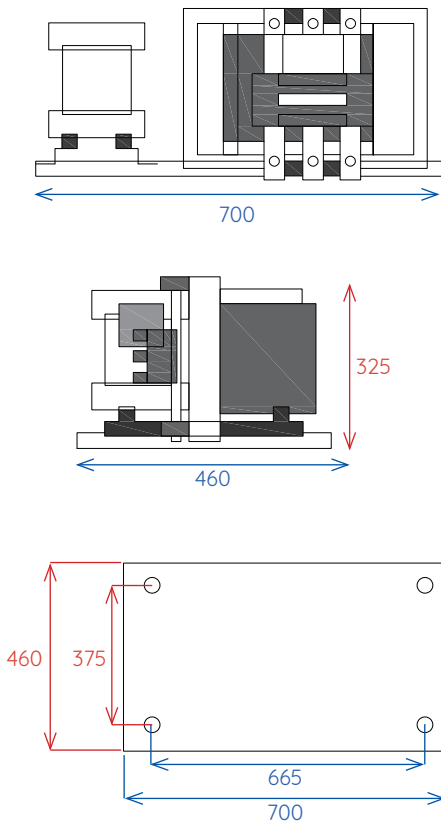
C7s series compensation racks provide to customers different power options with its modular design. Its modular design provides rapid and effective solutions in installation, maintenance and system development period. Thyristor switching provides very fast switching and response instantly.

Some of facilities have fast changing loads. It means current level increases/decreases rapidly. When compensating these type of plants, using contactor is not a good way of switching because the design of a mechanical contactor is not suitable for fast switching and fault in a short time. So, using thyristor is the best way as a switching equipment. Electrical safety of plant is guaranteed thanks to its resistance to voltage and current rise.



C7s

Dimensions of C7s Rack



Advantages

- It helps us in installation and maintenance period thanks to its modular design
- Asset LTC series capacitors
- Switching on at zero voltage
- Switching off at zero current
- Protection against harmonics
- Increase the life time of capacitor
- Fast switching

Technical Characteristics

- Rated Voltage : 380 ... 525 V
- Nominal Frequency : 50/60 Hz
- Resonance Frequency : 132 ... 235 Hz
- Switching : Thyristor

Power (50/60 Hz)		Model / Reference	Weight (kg)
5 kVAr @525 V	3.125 kVAr @400 V	C7s-3P-5k-525V	15
10 kVAr @525 V	6.25 kVAr @400 V	C7s-3P-10k-525V	20
20 kVAr @525 V	12.5 kVAr @400 V	C7s-3P-20k-525V	30
40 kVAr @525 V	25 kVAr @400 V	C7s-3P-40k-525V	35
80 kVAr @525 V	50 kVAr @400 V	C7s-3P-80k-525V	50
120 kVAr @525 V	75 kVAr @400 V	C7s-3P-120k-525V	80

Above types are our standard models. Please contact for specific request.

Capacitor Banks

BC series capacitor banks consist of C5 series compensation racks and high technology digital reactive power control relays.

BC series capacitor banks provide customers different power level options thanks to its racks which have modular design. That modular design provides rapid and effective solutions in installation, maintenance and system development period.

BC series capacitor banks switch on / off the steps softly and instantly thanks to high technology digital reactive power control relays. Relay determines to switch on / off the capacitors according to the feedback calculations coming from CT and VT.

Advantages

- Easy montage / maintenance thanks to its modular design
- Withstand $1.18 \times U_n$ over voltage and $1.50 \times I_n$ over current thanks to LTC series capacitors
- 5 compensation racks can be put into panel easily thanks to its efficient cooling system. Its power level can be raised up to 500 kVAr
- Protection against touching

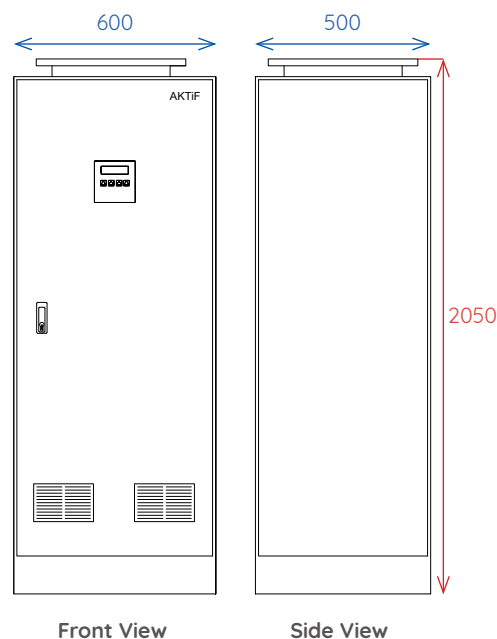
Technical Characteristics

- Rated Voltage : 400 / 415 / 690 V
- Nominal Frequency : 50 / 60 Hz
- Max. Power for 1 panel : 500 kVAr
- Up to 5 racks in one panel
- Standarts : EN 61439-1/2, EN 60831-1/2, EN 60076-6, EN 60529, EN 60255-1, EN 60947-4-1



BC

Dimensions



Capacitor Banks

Capacitor Banks with Detuned Harmonic Filters

BF series capacitor banks consist of C7 series compensation racks and high technology digital reactive power control relays.

BF series capacitor banks provide customers different power level options thanks to its racks which have modular design. That modular design provides rapid and effective solutions in installation, maintenance and system development period.

BF series capacitor banks switch on / off the steps softly and instantly thanks to high technology digital reactive power control relays. Inrush current limiting features of BF series capacitor banks do not help increasing the inrush current when capacitor units are switched on.

Advantages

- Easy installation / maintenance thanks to its modular design
- Withstand $1.18 \times U_n$ over voltage and $1.50 \times I_n$ over current thanks to Asset LTC series capacitors
- Compensation racks have harmonic filter reactor which protects capacitors against harmonics

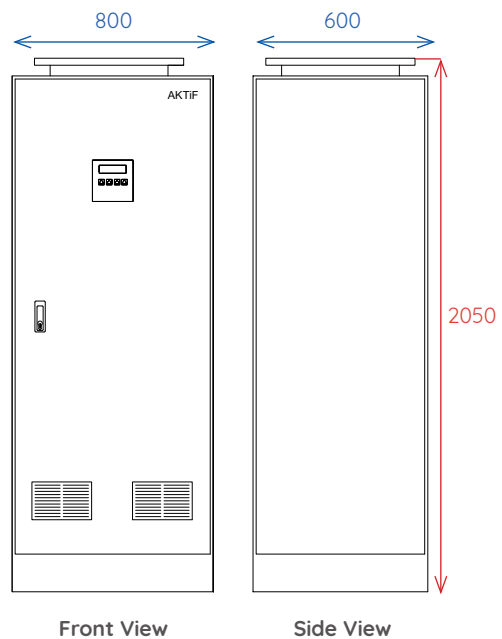
Technical Characteristics

- Nominal Voltage : 400 / 440 / 525 / 690 / 960 V
- Nominal Frequency : 50 / 60 Hz
- Resonance Frequency : 189 Hz, 210 Hz, 215 Hz (and optional other frequencies)
- Over Current : $1,5 I_n$
- Standarts : EN 61439-1/2, EN 60831-1/2, EN 60076-6, EN 60529, EN 60255-1, EN 60947-4-1



BF

Dimensions



Capacitor Banks

Thyristor Controlled Capacitor Banks with Detuned Filters

BFs series thyristor controlled capacitor banks are designed to supply the needed reactive power by allowing switching very fast according to the need of fast changed loads. Thyristor switches prevent the inrush currents and the detuned type harmonic filter reactors are used in series with the capacitors to prevent the dangerous harmonic current flows and reduce the harmonic effects.

BFs series fast type capacitor banks have modular design by using C7s series static compensation racks inside. Racks are ready to use with its plug and play design without necessity to any other component and very easy to install and increase or to install, to increase the power of capacitor bank. Furthermore, It protects against touching voltage, and guarantees the electrical safety of plant due to over voltage and over current design.

Advantages

- Allows fast reactive power compensation
- Reduces the harmonics
- Increases the life of capacitors and other equipment like motors, transformers, etc...
- No transient currents occurs
- Safety against touching
- Allows maintenance from the front
- Reduces the maintenance cost
- Long life by using of LTC capacitors and AR reactors
- Allows easy power increase

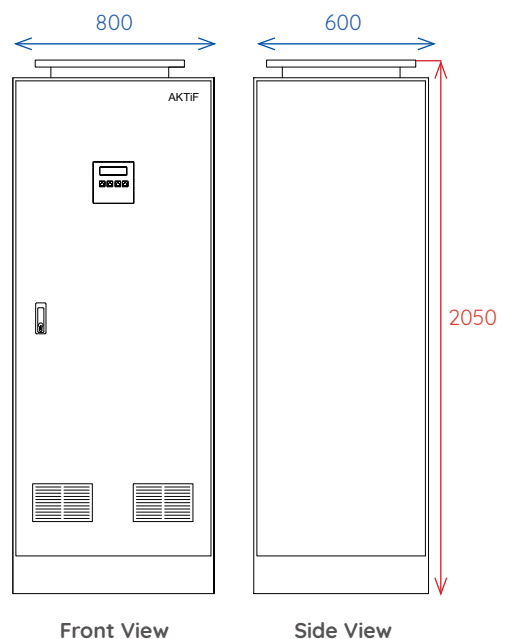
Technical Characteristics

- Rated Voltage : 380 ... 525 Vac
- Loss factor < 6 W/kVAr
- Nominal Frequency : 50 / 60 Hz
- Environment Temperature : -10 ... +45 °C
- Switching : by Thyristor switch
- Switching time < 40 ms
- Applicable Standards : EN 61439-1/2, EN 60831-1/2, EN 60076-6, EN 60529, EN 60255-1, EN 60947-4-1



BFs

Dimensions



Shunt Reactor Banks

BR series shunt reactor banks are designed by using SR series shunt reactors, high technology digital reactive power control relay, protection and control equipment.

Application areas of the shunt reactor banks are mostly industrial zones having long transmission line / distribution cables, subways and light rail systems, etc.

Advantages

- Availability for different voltage and power levels
- Easy installation at site
- Long maintenance period
- Remote monitoring and controlling with Scada system
- Easy to power increasing with its modular design

Technical Characteristics

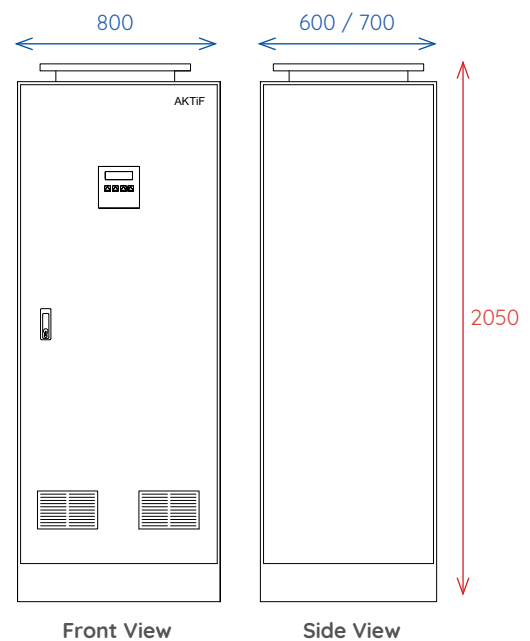
- Rated Voltages : up to 1000 Vac
- Nominal Frequency : 50 / 60 Hz
- Max Power for 1 panel : 200 kVAr
- Ambient temperature : -40°C / 55°C
- Applicable Standard : EN 61439 - 1/2
- Mechanical resistance for high short circuit powers



BR



Dimensions



Capacitor Banks

Metal Enclosed Capacitor Banks

SME-CC series Metal Enclosed Capacitor Banks are designed for indoor applications by using SME series Metal Enclosed Switchgears which are type tested and certified according to IEC 62271-200. SME-CC Capacitor Banks are made of high quality power capacitors, damping or harmonic filter reactors being used for the following industrial purposes;

- Capacitor Bank applications
- Detuned Harmonic Filter applications
- Tuned Harmonic Filter applications

SME-CC series Metal Enclosed Capacitor Banks / Filter Banks are designed in two type as below;

- Fixed for fixed loads like transformers and motors
- Automatic for the changed loads

SME-CC series Metal Enclosed Capacitor Banks / Filter Banks use Vacuum contactors up to 24 kV voltage level and Vacuum / SF6 circuit breakers for more voltage level.

SME-CC series Capacitor Banks provide excellent results in any kind of applications of power factor correction with;

- Reactive power compensation
- Harmonic filtration

Advantages

- Modular, compact and robust design optimized for possible future expansion, facilitating transport, storage and installation
- Design and testing are carried out in accordance with the requirements of the latest edition of the relevant standards and the specific technical demands of customers
- Ensures high reliability and low maintenance costs with its simplified design and proven components usage
- The banks are supplied as fully assembled units, factory tested and ready for connection

Technical Characteristics

- Nominal Voltage : up to 40,5 kV
- Nominal Frequency : 50/60 Hz
- Nominal Power : on demand



SME-CC



Capacitor Banks

Open Type Capacitor Banks

OBH Series Open Type Capacitor Banks are designed for indoor applications with high quality power capacitors and filters or damping reactors on the galvanized steel construction.

OBH Series Open Type Capacitor Banks are suitable for applications of transformer fixed bank or motor fixed bank or multistep central automatic capacitor bank system at different voltage and frequency.

OBH Series Open Type Capacitor Banks can use for tuned harmonic filter systems, detuned harmonic filter systems, SVC systems and classical power factor correction systems.

These open type capacitor banks generally install on outdoor. But if there is enough built area or outdoor area suitable for install sheet steel kiosk or mono block concrete kiosk or prefabricated concrete kiosk, there is not any problem for capacitor banks can be install in kiosks on outdoor.

Advantages

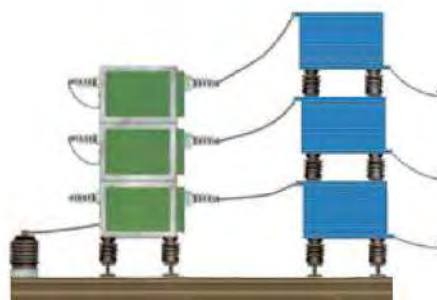
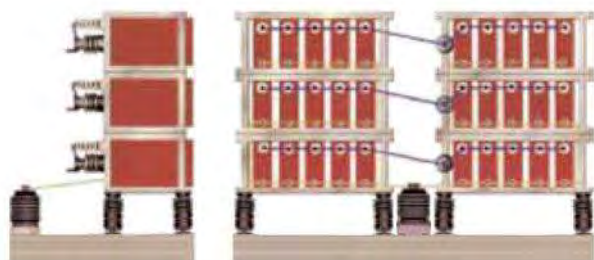
- Modular, compact and robust design optimized for easy future expansion of the system, facilitating transport, storage and installation
- Galvanized steel or aluminum open type construction available for indoor and outdoor installations
- Design and testing comply with the requirements of the latest edition of relevant standards and the specific technical requirements set by the customers
- Use of simplified design and proven components ensures high reliability and low maintenance costs
- The banks are supplied as fully assembled units or non-assembled units, after all factory test completed and ready for connection



OBH

Technical Characteristics

- Nominal Voltage : 3 - 170 kV
- Nominal Frequency : 50/60 Hz
- Nominal Power : 250 kVAR ... on demand
- Standards : IEC 60871-1



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D

Smart Grid



Energy



Industry



Building



Solar Systems



Energy Management Systems

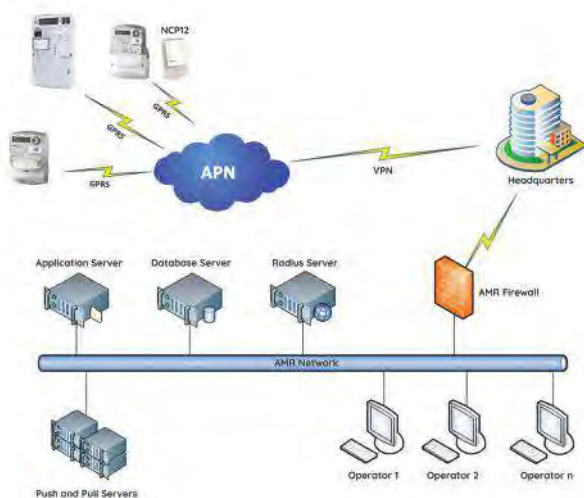
Actwin Smart Energy Management Software

Actwin Smart is an energy management and AMR software that automatically gathers data from devices like meters (electricity, water, gas etc.), analyzers, relays, remote IOs and prepares reports and invoices.

- Multi language support
- Ability to use commonly used and secure Microsoft SQL, Oracle databases...
- Distributed structure like “server”, “client”, and “internet” interface.
- “Server” is the main engine as working at background and collects data from devices.
- “Client” is the application part which management is done with interaction to server. Server and client interfaces are desktop applications.
- “Internet interface” provides, users (like factories) to enter the system and monitor consumption, energy quality and creates reports of their own devices.

Software Modules

- Communication and data validation
- Reporting
- Billing
- Loss/Leakage Detection
- Single-Line Diagram and Map presentation
- Integration with web services
- Alarm Management, SMS and e-mail notification
- Internet interface
- User Management and Inventory
- Authentication



Communication

Actwin Smart has modular structure to provide different new protocols to be found in the future. Supported protocols are listed below.

Communication principle is compatible with “push” and “pull” structure. Data collection schedule, result saving to the database schedule can be defined and measurement parameters that will be read from each device can be defined independently.

Communication module starts automatically when server starts as windows service. This prevents users from accidentally closing the data collection application.

Communication Protocols

- IEC 62056-21 Mod C and constant baud rate
- DLMS/Cosem
- Modbus-RTU
- Modbus-TCP/IP
- M-Bus
- Wireless M-Bus

Communication Interfaces

- Serial communication (RS485, RS232)
- GPRS
- M-Bus
- Ethernet
- PLC (DLC)
- RF

Energy Management Systems

Reporting

Reports can be prepared as below with collected data. The modular structure provides capability to add new reports to the software when needed. There is no need to upgrade or modify the software when a new report is requested. All reports can be exported as MS Excel, MS Word, HTML and PDF.

- Reporting as a table of all selected device measurements. Also measurements to be reported can be selected
- Graphic display of desired device measurements
- Multiple device measurements can be drawn on the same chart
- Measurement points can be compared with algorithms like consumption, average values etc...
- Active and reactive energy ratio reports for electricity meters
- Consumption reporting for electricity meters according to energy tariffs
- Distribution network load reports (Transformer, gas stations)
- Measurement point daily, monthly, and yearly consumption reports
- Map display, showing the measurement points with filters (Reactive energy, low consumption, loss/fraud situations, no communicated points etc...)
- Transformer loss report
- Total consumption of distribution network as monthly and yearly, import/export with comparison between time periods
- Defined gas component reports
- Natural gas minimum/maximum hourly, daily consumption report
- Measurement point inventory report
- Measurement point communication performance report
- Water meters low/extreme consumption report



Loss/Leakage Detection

- Loss/Leakage reports can be prepared manually and automatically. Automatically prepared reports can be sent to defined person as e-mail
- Electricity meter parameters (events, current/voltage/ power/ power factor/phase angle etc...) can be monitored continuously and alert operators if an unexpected measurement or ratio is measured
- Unexpected consumption differences are detected between main distribution points and points connected to that distribution point
- The interventions to meter and panel covers can be detected and operators can be alerted

Data Validation

Measurements should not be used on invoices and reports before data validation. For that reason some data validation methods like below are used

- Checking the measurement in specific limits
- The ratio of measurement according to consumptions of previous periods consumptions
- The change ratio according to last measurements
- Checking in or not in standard deviation according to average value of last billing periods
- Check between measurement unit and measurement

Integration

Synchronization to other systems like ERP, accounting, geographic informative, bank etc... can be provided with Web Services.

Energy Management Systems

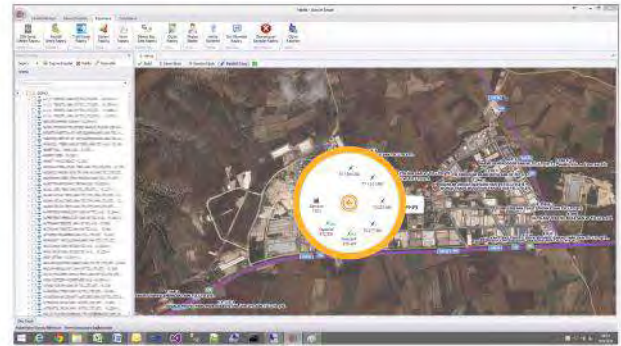
Customer Management and Inventory

Report can be generated from all type records that are saved in database like defined measurement points, customers and groups.

- New user and/or measurement point can be defined without professional skills with copy paste method.
 - There is no limit in user defined information on measurement point and customer cards.
- Some predefined information are:

- > Customer Number
- > User Name
- > Address/Parcel Information
- > User Type
- > Start in operation date
- > Authorized Person
- > Contact information like phone, fax, e-mail etc.
- > GPS coordinates

- Reports can be taken from these defined information, and then allowed to be made by grouping, listing and filtering.



ActWin

Single-line Diagram

- Electrical distribution network can be showed on single-line diagrams like SCADA systems and the information of instruments like electrical meters, secondary protection relays on this network can be monitored.
- Electrical meter's power-current/voltage values, secondary protection relay's on/trip situations and quality recorder's power-current/voltage values can be monitored with digital and analog instrument display
- Gas meters, measurement values, filter impurity situations, door/valve situations belong to type B and C stations can be displayed
- Drag and drop supports
- Infinite number of screens can be created



Web Interface

Internet interface has customers monitor their own consumptions and energy quality parameters. Accessing to interface is done by entering username and password and users can only reach their own measurement points.

For security, there is no direct connection through the system in internet. There is a safe web service level between internet interface and database.

- Users can view historical measurement values of their own measurement points
- Users can view common or personal messages from management
- Natural gas consumers can send to AMR system their forecasts and check their forecasts reports
- Users may have alerts like reactive penalty, maximum demand exceeding, minimum and maximum gas consumption

Authorization

- The roles can be defined with the pre-defined permissions on system. Users can be defined and roles can assigned to users
- Operators can make authentication based on measurement points. They can define which users can reach to which measurement points

Alarm Management

- Event record on measurement instruments can be saved and reported on database
- System watches reactive energy consumptions and if there is a measurement or over the limits, system informs the users with e-mail and SMS
- E-mail and SMS notification can be saved on database and reported later

Metering and Submetering

GPRS Communication Unit

Asset NCP12 industrial communication device is used to monitor and control electricity, water, gas meters and other control equipment over GSM/GPRS and Ethernet network.

Modem supports commonly use protocols like IEC 62056-21, DLMS/Cosem, Modbus-RTU, M-Bus (with module) etc. This enables NCP12 to communicate and transfer read values to Head-End systems with almost all meters in the market.

Five different simultaneous connections can be opened to the modem. Each connection may send and receive from different serial interfaces like RS485, RS232 and USB. the connections may even send to the same interface and modem will queue and process them in timely fashion and respond to the connection that sent the data.

- Ability to work and notify head-end system for 15 minutes after energy cut off
- Two expansion slots for additional communication and IO ports
- Wide range ac/dc auxiliary supply.



NCP12

Technical Characteristics

- ARM Cortex M3 processor, Telit GSM/GPRS module
- 1 MB internal memory
- 85 – 265 Vac, 120 – 370 Vdc auxiliary supply
- 2 pcs digital output (expandable and can be used as relay output)
- 2 pcs digital input (expandable)
- 25F Super capacitor to notify energy cut off while de-energized for 15 minutes
- Remote firmware update



Medical Power & Control Panels E

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E

Medical Power & Theatre Control Panels



Medical Plants



Isolated Power Systems

Isolated power systems are used in group 2 rooms in medical locations, and they consist of auxiliary devices and test combinations such as isolated power panels and insulation transformer, isolation monitoring device, remote alarm panels.

When isolation fault occurs with isolated power systems, it is ensured not to cause the system to energy interruption by opening protection equipments, to continue medical electrical equipments to their functions, not to decrease fault currents to non-critical values and not to live problem during operating by preventing energy interruption.

Isolation level is monitored continuously in isolated power systems and converts the fault to alarm signal by detecting at adjustable level provided that it is not less than 50 k Ω . The alarm in question takes part on control panels in operating theatres and on a section where nurse or technical personnel can easily hear and then control and intervene it in other rooms by monitoring over two remote alarm panels. Alarm panels used for the purpose of remote monitoring take part in room of personnel in duty or in technical service room.

Transformer temperature and load current information out of isolation level is continuously monitored and it is ensured to detect immediately and to give alarm when it gets out of nominal values.

The following medical locations are defined as group 2 room in accordance with IEC 60364-7-710 standard and isolated power system is used in these rooms.

- Operating theatres
- Intensive care rooms
- Operating preparation rooms
- Operating recovery rooms
- Anesthetic rooms
- Heart catheterization rooms
- Angiographic examination rooms
- Premature baby rooms

Advantages & Benefits

- Affecting of personnel and patient from electrical shock is prevented
- Isolation fault does not cause power interruption.
- Fault current in electrical system is decreased to levels that are not critic
- Continuity of power for medical locations is provided.
- Electrical fault monitoring is taken under guarantee.
- Fire risk caused by the faulty current is prevented.
- It is ensured to protect high cost medical equipments against electrical faults
- Examination information obtained at a long of time vanishes as a result of electrical interruption
- Additional faulty currents are gathered and they are prevented to reach critic values
- Suspension for operating is prevented



Isolated Power Panels

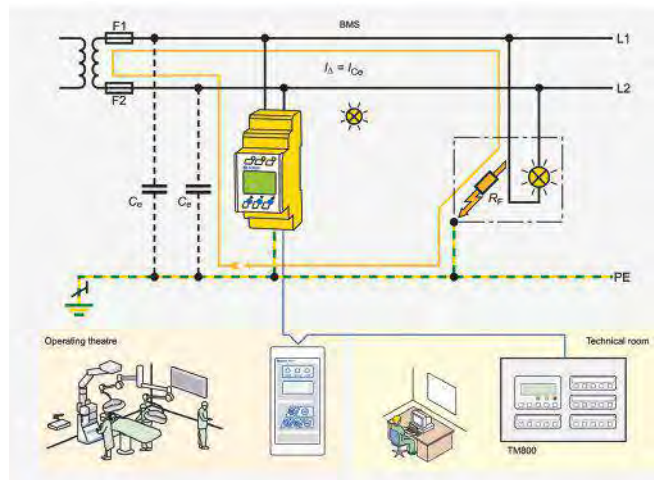
These panels are isolated power system having applications of IT systems in medical locations realizes supply of each group 2 room in compliance with IEC 60364-7-710 standard. Isolated power panel which are equipped with the most important equipment of the system such as isolation transformers and isolation monitoring device provides supply of electric equipments in group 2 rooms, wall plugs of devices supplying life support and of critical loads, operating control panel, operation lamp and similar lamps. All the aforementioned loads are protected against short circuit current by using double-pole fuses in accordance with IT system. Although isolated power panels have their own cooling system, it removes warm-up problem thanks to effective air circulation.

Technical Specifications

Brand name	AKTIF
Type	IGP 0710/1P-XX
Standards	IEC 60364-7-710:
Rated power of outgoing	3.15 / 4 / 5 / 6.3 / 8 / 10 kVA
Power supply unit	Double single phase
Rated voltage	230 Vac
Rated frequency	50 / 60 Hz
Rated insulation level	3 kV / 1 min
Input protection	gL fuse
Secondary output voltage	230 Vac
Output protection	2-pole fuses
Monitoring	isolation resistance with LCD display
Alarm output	isolation fault, excessive load, excessive temperature
Functional Test	advanced isolation fault
Leakage current to enclosure	< 0,5 mA
Response range	50 - 500 kΩ
Isolation fault detection time	< 1 s
Operating temperature	-5.....+50 °C
Storage temperature	-25.....+60 °C
Panel sizes	410x430x1750 mm
Distribution outlet	6-12-18 pieces as standard
Cooling system	With fan
Protection class	IP 31
Color	RAL 7035 / RAL 9003



IGP

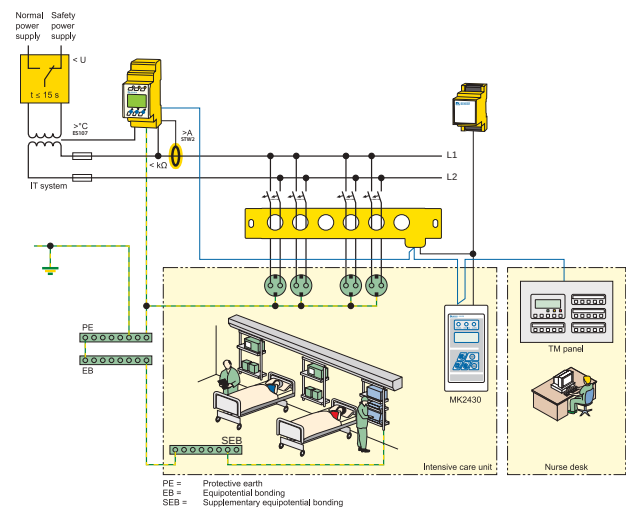
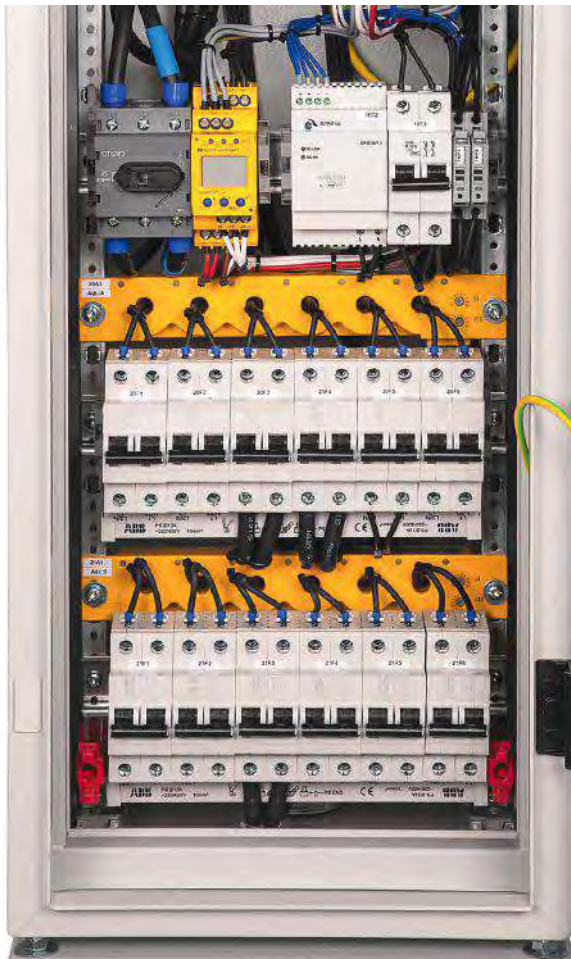


Insulation Fault Location Systems

Insulation fault location in IT systems

In medical locations, IT systems with insulation monitoring are intended to supply medical electrical equipment. That ensures reliable power supply, even when a first fault occurs. In addition a fast location and elimination of the insulation fault is required.

Particularly in the view of the variety of electrical equipment (e. g. socket outlet circuits) used in intensive care units, insulation fault location is disruptive and costly in terms of time and money. The insulation fault location system is the modular solution for this problem. It facilitates precise localisation of insulation faults without disruption to the operation of the power system.



Advantages:

- Insulation fault location during operation
- Fast localisation of faulty circuits/equipments
- Reduced maintenance costs
- Central indication via LC text display at remote alarm indicator and operator panels

System functions:

- Indication of faulty branch circuits
- Easily retrofitting with existing installations due to the modular design
- Measuring current transformers in different sizes and designs
- Up to 528 sub circuits can be monitored
- Communication via two-wire connection
- Universally applicable for all IT systems

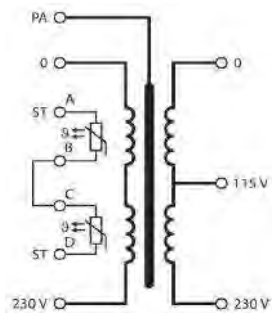
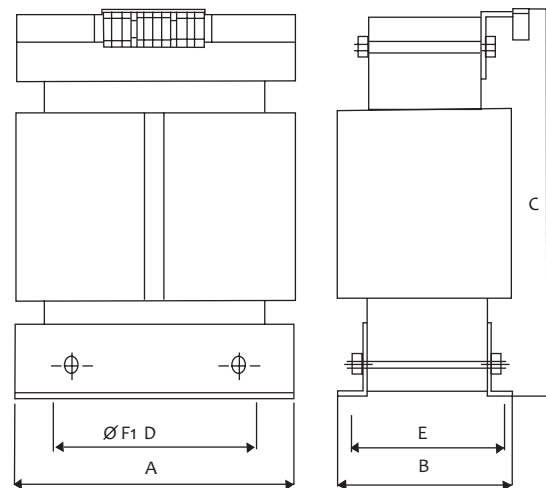
Isolating Transformers

IT 0710 medical isolating transformers are designed compatible with IEC 60364-7-710 standards for power supply of single phase IT systems and produced in accordance with EN 61558-2-15 standards. Constant angles are isolated from transformer core thanks to a static display placed among primary and secondary coils. Asset medical isolating transformers having galvanic isolated coils provide possibility of monitoring of temperature thanks to PTC thermistors placed into coils. Asset medical isolating transformers designed at 6 different power value between 3,15...10 kVA have high excessive load capacities.

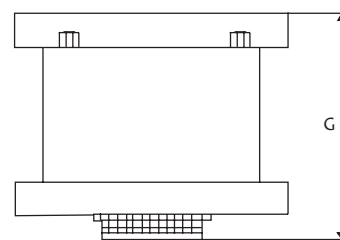
General Features	
Type	IT 0710
Power range	3,15 / 4 / 5 / 6,3 / 8 / 10 kVA
Frequency	50 / 60 Hz
Primary Voltage	230 Vac
Windings	Al, Cu
Secondary Voltage	230 / 115 Vac
Inrush current (Ie)	< 12.I _n
Leakage current	< 0,5 mA
No-load input current (I _o)	< 3%
No-load output current (U _o)	< 236 V
Short-circuit voltage (U _k)	< 3%
Max ambient temp	40 C
Protection class	IP 21 (optional)
Isolation class	B (120) , F (155) , H (180) °C
Cooling	Air cooling
Standarts	TS HD 603647-710, TS EN 61558-2-15



IT 0710



Wiring Diagram
IT 0710



Dimension
Diagram IT 0710

Size and Weights									
TYPE	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	G(mm)	Weight(kg)	Power
IT 0710-3,15	265	195	325	200	155	8,5x17	220	51	3,15 kVA
IT 0710-4	280	195	370	240	155	8,5x17	220	57	4 kVA
IT 0710-5	280	205	325	240	165	8,5x17	230	61	5 kVA
IT 0710-6,3	280	220	325	240	180	8,5x17	245	65	6,3 kVA
IT 0710-8	280	235	325	240	195	8,5x17	260	74	8 kVA
IT 0710-10	320	235	420	270	195	8,5x17	280	100	10 kVA

Changeover Modules

CTS 710 Changeover modules are used for transferring power source between two independent sources in order to provide continuous energy flow for critical loads.

Generally, independent sources are uninterruptable power source (UPS) and mains power. In normal operation, critical loads are supplied from the mains power as the primary. When there is a problem with the primary source like low/high voltage or blackout, transfer relays detect the failure and automatically transfer the source to a secondary supply.

Automatic transfer relays are often used in supplying medical loads in hospitals especially the equipment that are used in operating theatres and intensive care rooms but could be used in any place where constant power is vital.



CTS 710

Electrical Specifications	
Auxiliary Voltage	220 VAC ± %25
Mechanical Specifications	
Height	90 mm
Width	152 mm
Depth	60 mm
Weight	420 gr
Mechanical Protection Class	IP 20
Environmental Conditions	
Relative Humidity	% 20-90 Condensing
Operating Altitude	2000m Maximum
Operating Temperature	0 °C / + 45 °C
Standarts	
EN 60947-6-1	
IEC 60364-7-710	

Advantages

- Switching between independent sources
- LCD Screen
- Selected source priority
- Automatically and manually transfer
- Fast dioagnostic solution by microprosser control
- Easy maintenance and installation facility
- High efficiency
- RS 485 Serial Communication port

Operating Theatre Control Panels

OCP Series

OCP Series Operating Control Panels are contemporary and reliable devices, designed for maintaining the most comfortable environment possible both for patient and surgery team and the most suitable working conditions required in the surgery room.

All electrical controls can be done manually via OCP Series Operating Room Control Panel's screen. Another feature is performing all data exchange required for automation, and solely undertake all automation tasks even in non-central automated environments.

Panels allow operation of the four different armature groups separately such as; turning on/off and controlling the operation lamp, Negatoscope control, music broadcast channels, Hands Free phone, SIP-Phone, medical gas alarm indicator, temperature, humidity, hepa filter pollution, differential room pressure indicator and hour-chronometer features as integrated in the panel.



OCP-9



OCP-10



OCP-11



OCP-21



OCP-9



OCP-9 provides many advantages to a user with its “Smart Care” supervision feature with 7” resistive touch screen which is easy to clean.

All electrical controls can be manually performed on the 7” touch screen, desired values can be displayed as integrated into air conditioning automation. Communication with high-quality audio provided by the digital audio processor with the hands-free phone through the same touch-screen is also available.

OCP-9 Technical Specifications

- DIN 4301 stainless steel front panel
- 7” Resistive touch screen
- Smart Care warning system
- General lightning control
- Operation lamp control
- Negatoscope control
- UV lamp control
- Busy lamp control
- Time and Chronometer (NTP Time Synchronisation)
- Four channel music broadcasting system
- 3 Watt powered audio amplifier
- External speaker support
- Medical gas alarm integrated to panel
- Temperature, humidity, hepa filter pollution, differential room pressure indicator
- Hands-Free analogue telephone
- AGS (Anaesthetic Gas Discharge) button
- Operating status: on / off information
- Event recording and system status
- Lightning dimmer control
- Temperature and humidity information outputs
- Electrical heater (automatic) control
- Embedded assembly
- Front panel dimensions: 600mm x 410mm
- Assembly dimensions: 585mm x 385mm x 110mm

OCP-10



All electrical controls required in the operating room can be manually performed by the OCP-10 Operating Theatre Control Panel having 21.5” capacitive touch screen, IP65 protection standard. OCP-10 includes 4 latching relays to provide continuity of lighting. In addition, LINUX based Operating Theatre Control Panel is able to exchange data via ModBus to the building automation systems.

OCP-10 Technical Specifications

- 21.5” Capacitive touch screen
- DIN 4301 stainless steel front panel
- LINUX based operating system
- RS-485, Modbus RTU master/slave communication interfaces
- Scada integration
- Smart Care warning system
- General lightning control
- Time and chronometer (NTP Time Synchronisation)
- Operation light control
- Negatoscope control
- UV control
- Medical gas alarm integrated to panel
- Four channel music broadcasting system
- External speaker support
- 12 Watt powered hi-fi audio amplifier
- 10W internal speaker
- Hands-Free analogue telephone
- Telephone book feature
- Electrical interruption protection with latching in-rush relay
- Temperature, humidity, hepa filter pollution, room differential pressure indicator
- AGS (Anaesthetic Gas Discharge) button
- Operating status: on / off information
- Event recording and system status
- Lightning dimmer control
- Temperature and humidity information outputs
- Electrical heater (automatic) control
- Embedded assembly
- Front panel dimensions: 600mm x 410mm
- Assembly dimensions: 580mm x 380mm x 110mm

OCP-11

All electrical controls required in the operating room can be manually performed by the OCP-11 Operating Theatre Control Panel having 21.5" capacitive touch screens, IP65 protection standard.

In addition, LINUX based Operating Theatre Control Panel is able to exchange data via Modbus to the building automation systems. Besides there are some additional features like SCADA Integration, SIP-Phone in OCP-11.

OCP-11 allows the user to start operation with pre-configured customizable input profiles. Enhances the comfort of the operation by new designed hi-fi amplifier with more vibrant, high-quality and louder voice level.

OCP-11 minimizes accidents in the field with analog input/output protections.

OCP-11 Technical Specifications

- 21.5" Capacitive touch screen
- LINUX based operating system
- RS-485, Modbus RTU master/slave communication interfaces
- Scada Integration
- Smart Care warning system
- Customizable login profiles
- General lightning control
- Time and chronometer (Central hour integration)
- Operation light control
- Negastroscope control
- UV control
- Medical gas alarm indicator
- Four channel music broadcasting system
- MP3 feature
- Hands-Free VoIP phone
- Telephone book feature
- 15 Watt powered hi-fi audio amplifier
- 13W internal speaker
- External 8 ohms speaker support
- Electrical interruption protection with latching in-rush relay
- Temperature, humidity, hepa filter pollution, differential room pressure indicator
- AGS (Anaesthetic Gas Discharge) button
- Operation on / off information
- Event recording and system status
- Lightning dimmer control
- Temperature and humidity information outputs
- Electrical heater (automatic) control
- Easy software update with USB key
- Embedded assembly
- Front panel dimensions: 660mm x 460mm
- Assembly dimensions: 640mm x 435mm x 125mm



OCP-11

OCP-21

OCP-21 Operating Control Panel is a contemporary and reliable device, designed for maintaining the most comfortable environment possible both for patient and the surgery team and most suitable working conditions required in the surgery room.

All electrical controls required in the operating room can be manually performed by the OCP-21 Operating Theatre Control Panel having 21.5" capacitive touch screen with IP65 protection standard. In addition, LINUX based Operating Theatre Control Panel is able to exchange data via ModBus and TCP/IP to the building automation systems. Besides SCADA Integration, Internet access, Gesture sensor, PDF creation, IP phone, Ethernet, MP3 and USB connection features of the panel, the camera allows online video and voice streaming over the web.

Customizable inputs, 6-channel music broadcast input, external speaker support, voice command system, MP3 player, increased voice output to improve the comfort of the operation.

It offers the ability to communicate via VoIP and video conferencing over Skype platform.

While maintaining the safety of the device with analog input / output protection, it provides remote online live support with TeamViewer in case of any failure which may occur.

OCP-21 Technical Specifications

- LINUX based operating system
- DIN 4301 stainless steel front panel
- 21.5 inch capacitive touch screen
- RS-485, Modbus RTU master/slave, TCP/IP communication interfaces, external RS232 and CanBus support
- Voice control
- Scada and PACS Integration
- HBYS/PIMS over the web
- Internet access
- Hands-FreeVoIP phone, video conference over VoIP
- Hands-Free analog phone
- Telephone book feature
- Camera, MP3, USB features
- PDF viewer
- Customizable user profiles with macro function buttons
- 3 line general lighting control
- Power failure protection by latching in-rush relay
- Control of Operation, UV, Busy, Negatoscope light
- Lighting and negatoscope intensity controls between 0% to 100%
- 6 channel music broadcast channel selection
- 15 Watt power amplifier, music volume adjustment
- 13 Watt internal speaker
- External speaker support
- Digital clock and chronometer (ascending and descending counter), central clock integration
- Analog input/output protections
- 10 channel medical gas alarm panel
- 0-10V automation outputs for temperature and humidity levels
- Integration to different automation systems via customizable voltage / current options for analog inputs
- Temperature, humidity, differential room pressure, hepa filter pollution monitoring and setting, audible and minous warning when set value is exceeded
- Voice notification buttons to disable undesirable alarm notifications
- Operating status: on /off information, operating room busy lamp sign
- Damper open/close manual control, flow control
- AGS (Anaesthetic Gas Discharge) button
- Sending information to automation by 8 analog 0-10V outputs and 8 digital input/outputs
- Event recording and system status
- Embedded assembly
- Front panel dimensions: 660mm x 460mm
- Assembly dimensions: 640mm x 435mm x 125mm



OCP-21

OCP Series Comparison Chart

	MODEL			
Physical	OCP - 9	OCP - 10	OCP - 11	OCP - 21
7 inch resistive touch screen	✓	-	-	-
21.5 inch capacitive touch screen	-	✓	✓	✓
DIN 4301 stainless steel front panel	✓	✓	✓	✓
Monitoring & Control				
General lighting control	✓	✓	✓	✓
Operation, Negatoscope, UV, Busy sign control	✓	✓	✓	✓
Dimmer control	✓	✓	✓	✓
Operating on / off information	✓	✓	✓	✓
Electrical heater (automatic) control	✓	✓	✓	✓
Temperature, humidity, hepa filter pollution, room differential pressure indicator	✓	✓	✓	✓
AGSS (Anesthetic Gas Scavenging Systems)	✓	✓	✓	✓
Electrical interruption protection with latching in-rush relay	-	✓	✓	✓
Analog input / output protections	-	-	✓	✓
Voice Recognition & Control	-	-	-	✓
Customizable login profiles for surgery, cleaning and service	-	-	6 profiles	6 profiles
Communication				
Ethernet connections	1	1	2	2
Modbus-TCP/IP Communication	-	-	-	✓
Scada Integration with Modbus RTU	-	✓	✓	✓
Gas alarm panel communication with Modbus-RTU	✓	✓	✓	✓
Audio				
Audio Channels	4	4	4	6
Internal speaker	✓	✓	✓	✓
Audio amplifier for external speakers	3W	12W	15W	15W
USB MP3 Player	-	-	✓	✓
Phone				
Hands-Free Analogue telephone	✓	✓	-	✓
Hands-Free VoIP phone	-	-	✓	✓
Telephone book feature	-	✓	✓	✓
Video Conference over VoIP	-	-	-	✓
Skype	-	-	-	✓
Multimedia				
Internet access with Browser	-	-	-	✓
PDF viewer	-	-	-	✓
Synchronization				
PACS Integration	-	-	-	✓
NTP Clock Synchronization	✓	✓	✓	✓
Support				
Event recording and system status	✓	✓	✓	✓
Teamviewer Support (Remote Support)	-	-	-	✓
Easy USB Software Upgrade	-	-	✓	✓

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F

Traction Power System



Traction Rectifiers

The heart of the DC Traction Power Supply Systems is the Rectifier which is the Power converter responsible to transform the Alternate current into Direct Current used to feed the trains.

COET NCR cubicle includes a wide range of Rectifiers which satisfy the strictest requirements of an Electric Traction project and is following the latest EN 50328 and IEC60146 International standards.

The power conversion takes place by means of diode Graetz bridges with natural air cooling.

The cubicle consists of a self-standing frame with steel plates of suitable thickness and mechanical strength with suitable reinforcing ribs and folds; the surfaces of the framework are covered both internally and externally with double layer painting with "orange peel " finishing, to guarantee a better durability.

Cooling system is AN (air natural): each power silicon diode is cooled on both sides by aluminum heat sinks. The efficient cooling system allows diodes low temperature and reduced loss granting high reliability and long life of the rectifier.



T-RECT

Main Technical Data

Reference standards	EN 50123 IEC 61992		
	750 V	1500 V	3000 V
Nominal voltage U_N	750 V	1500 V	3000 V
Maximum permanent voltage U_{max1}	900 V	1800 V	3600 V
Maximum not permanent voltage U_{max2}	950 V	1950 V	3900 V
Rated insulation voltage U_{Nm}	1,8 kV	3 kV	4,8 kV
Rated impulse voltage U_{NI}			
— to earth and between the poles	15 kV	20 kV	40 kV
— across an isolating distance	18 kV	24 kV	48 kV
Industrial frequency voltage U_a			
— to earth and between poles	6,9 kV	9,2 kV	18,5 kV
— on the disconnecting distance	8,3 kV	11 kV	22,2 kV
— auxiliary circuits	2 kV	2 kV	2 kV
Nominal power	up to 4,5 MW	up to 6 MW	up to 6 MW
Nominal current	up to 6000 A	up to 4000 A	up to 2000A
Peak inverse voltage of diode	2600 V	4500 V	4500 V
Overload	up to class VI	up to class VI	up to class VI

Main Features

- Segregated compartment for Power and Low Voltage
- Bridges Connection: series or parallel
- With or without fuses for short circuit protection
- Diode Diagnostic unit (OPTIONAL)
- Interphase reactor (OPTIONAL)
- Np+1 or Np-1 Diode redundancy (OPTIONAL)
- RC overvoltage protection
- Execution fixed or withdrawable with manual or motorized truck (OPTIONAL)
- Duty Class up to class VI
- AC input from top or bottom
- DC Outgoing from top or bottom
- Front Access only, for use in reduced depth substation like container (OPTIONAL)

Feeder Cubicles

Metal Clad Feeder HSCB Cubicles are designed for Railway application with the switching capacity of 750/1500/3000 V DC up to 10.000 A.

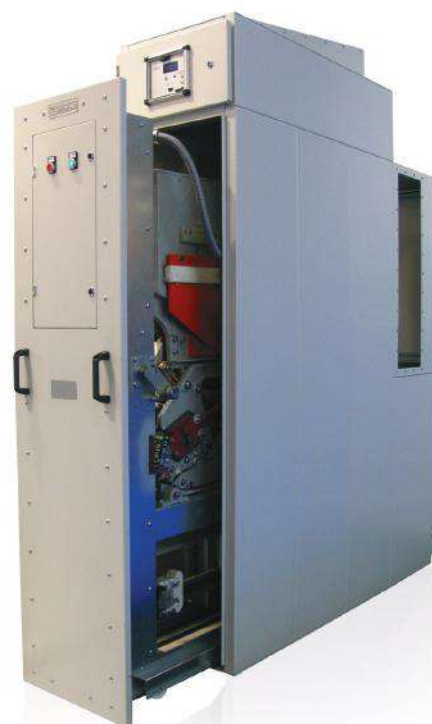
In DC Power supply system Feeder Cubicle is used:

- to feed and to protect a DC line section of a traction system for Metro, tramway or trolleybus (Feeder).
- as back-up to the main Feeder Cubicle (By-pass)
- for Rectifier protection and for feeding the omnibus bars (Incoming)

The cubicle consists of a self-standing frame and steel plates of suitable thickness and mechanical strength with reinforcing ribs and folds. The surfaces are covered both internally and externally with double layer painting with "orange peel" finishing, to guarantee a better durability.

Cubicle consists of 4 segregated sections:

- HSCB compartment
- Omnibus bus-bar compartment
- Outgoing cables compartment
- Low voltage compartment



NCA

Main Technical Data

Reference standards	EN 50123 IEC 61992		
	750 V	1500 V	3000 V
Nominal voltage U_N	750 V	1500 V	3000 V
Maximum permanent voltage U_{max1}	900 V	1800 V	3600 V
Maximum not permanent voltage U_{max2}	950 V	1950 V	3900 V
Rated insulation voltage U_{Nm}	1,8 kV	3 kV	4,8 kV
Rated impulse voltage U_{NI}			
— to earth and between the poles	15 kV	20 kV	40 kV
— across an isolating distance	18 kV	24 kV	48 kV
Industrial frequency voltage U_a			
— to earth and between poles	6,9 kV	9,2 kV	18,5 kV
— on the disconnecting distance	8,3 kV	11 kV	22,2 kV
— auxiliary circuits	2 kV	2 kV	2 kV
Nominal current	up to 8000 A	up to 8000 A	up to 8000 A
Bus Bar current	up to 12 kA	up to 12 kA	up to 12 kA
HSCB	up to 8000 A	up to 8000 A	up to 8000 A
Short circuit current I_{Nss}	up to 85 kA	up to 85 kA	up to 85 kA
Short circuit current pick value $\hat{I}_{Nss}$	up to 125 kA	up to 125 kA	up to 125 kA

Main Features

- 4 segregated compartments for: Low Voltage equipment, HSCB, Omnibus bar and cables
- HSCB and Test Equipment placed on withdrawable truck (optionally motor driven) for easy maintenance with 3 positions (Service, disconnected/Test and removed)
- Multifunction Protective relay and PLC.
- Interlocking system customizable on request.
- Line and Earthing switch (optional)
- By-pass bus bar with Disconnecter (optional).
- AFLR Internal arc protection feature (70/100 kA, 250 ms) (optional)
- Outgoing cables from top or bottom
- Front access only for use in reduced depth TPS like container (optional)

Disconnecter Cubicles

In DC Traction Power Supply Systems, the disconnecting cubicles can be used for different functions:

- Two Poles or Positive and Negative Disconnectors are installed downstream the rectifier to isolate Omnibus Busbars from Rectifier itself.
- Parallel or By-Pass disconnector are installed between two rectifier units to grant an adequate service continuity in case of out of service of one of the two rectifiers. COET NCD disconnecting Cubicles line offers an ideal compact solution cost effective and versatile to satisfy the most complex projects.

The cubicle consists of a self-standing frame and steel plates of suitable thickness and mechanical strength with reinforcing ribs and folds, the surfaces are covered both internally and externally with double layer painting with "orange peel " finishing to guarantee a better durability.

Cubicle consists of 3 segregated sections:

- Disconnectors compartment
- Busbars compartment (OPTIONAL)
- Low voltage compartment



LBD

Main Technical Data

	750 V	1500 V	3000 V
Nominal voltage U_n	750 V	1500 V	3000 V
Maximum permanent voltage	900 V	1800 V	3600 V
Maximum not permanent voltage	1 kV	1,95 kV	3,9 kV
Rated insulation voltage	1,8 kV	3 kV	4,8 kV
Rated impulse voltage			
— to earth and between the poles	15 kV	20 kV	40 kV
— across an isolating distance	18 kV	24 kV	48 kV
Industrial frequency voltage			
— to earth and between poles	6,9 kV	9,2 kV	18,5 kV
— on the disconnecting distance	8,3 kV	11 kV	22,2 kV
— auxiliary circuits	2 kV	2 kV	2 kV
Nominal current	up to 8000 A	up to 8000 A	up to 8000 A
Short-time withstand current	up to 85kA	up to 85kA	up to 85kA
Short-circuit current peak	up to 125kA	up to 125kA	up to 125kA

Main Features

- Segregated compartments for disconnectors
- Segregated low voltage compartment including measurements protective relay and PLC for SCADA connection in cable or fiber optic
- Motor or manual operated disconnectors with manual emergency operations
- Disconnectors main contact position visibility
- Voltage presence relays, earth fault relay and surge arrestors
- Cable connections from top or bottom
- Front access only for use in reduced depth TPS like container (OPTIONAL)
- Current and voltage measurement and protection relay

Voltage Limiting Device

In a DC Traction System, the return circuit (negative) shall usually have a high insulation level against the Earth to limit stray currents phenomena. In case of dangerous overvoltage, the return circuit shall be short-circuited to earth. For this purpose, a voltage limiting device shall be installed on each negative path.

COET Voltage limiting Device is fully in compliance with EN50526-2 standard, the most severe class (class 4) and with EN 50122-1/2 which define all the applicable and operating criteria.

Different executions available for indoor, outdoor or inside panel mounting. Available for 750 Vdc, 1500Vdc o 3000Vdc system, up to 100 KA short-circuit capability

- 7" Graphical Touch Screen Display
- Programmable single line diagram
- Voltage and Current Measurements
- USB port for Setting and Data Download/Upload
- Ethernet port RJ45 for SCADA System interface
- MODBUS or IEC61850 communication protocol
- Data Recording: events and oscillographic
- Main contact visibility
- Emergency manual operation of electromechanical switch
- Key lock for maintenance



LBR

Main Technical Data

Reference standards	EN 50122-1/2 EN 50526-2		
Rated voltage	750 V	1500 V	3000 V
Rated insulation voltage	900 V	1800 V	3600 V
Rated impulse withstand voltage			
— Between contacts and earth	15 kV	20 kV	40 kV
— Across isolating distance	18 kV	24 kV	48 kV
Power-frequency withstand voltage			
— Between contacts and earth	6,9 kV	9,2 kV	18,5 kV
— Across isolating distance	8,3 kV	11 kV	22,2 kV
— Auxiliary circuits	2 kV	2 kV	2 kV
Breaking capacity	900 A	900 A	900 A
Highest peak making current	50 or 100 kA	50 or 100 kA	50 or 100 kA
Short-time withstand current peak value	50 or 100 kA	50 or 100 kA	50 or 100 kA

Main Components

- A Thyristor static switch (SCR) with direct trigger command board to satisfy the instantaneous closing (<10ms) in case of fault. Trip Level can be set at 300 or 600 V
- A mechanical short-circuit device (MTA) with Making and Breaking Capacity capable to close on to fault current higher than the maximum short-circuits current of the system (35-50- 100 kA) and to carry continuously 1.000 A current, thus granting the proper operation in safe condition
- A voltage transducer (TIM-V) measuring and discriminating AC and DC voltages
- A hall effect sensor (64-H) to measure the fault current and to manage the auto reclosing function of the electromechanical device locking it in closed position in case of current flowing between negative and earth
- A state-of-the-art digital protective relay (UA-VL) allowing two different operating modes:
 - a) Definite trip time: N°2 AC Overvoltage and N°2 DC Overvoltage levels with voltage and time thresholds settable independently. In this operating mode the above voltage/time curves are approximated in two steps
 - b) Inverse trip time: Trip time values are related continuously to the voltage measured according to the curves shown in the above picture therefore perfectly replicates the requirements of the standard.
- A graphical touch screen display (CPR-VL) to manage all the functions of the LBR device

Disconnecting Units

In DC Traction Substations one disconnector or Load break switch is normally installed downstream each High Speed Circuit Breaker thus allowing, in case of failure, to isolate the circuit breaker granting the safety of the system. The configuration is then completed by a by-pass or parallel disconnector switch connecting two feeders and allowing to grant the service continuity in case of failure of one circuit breaker. This disconnector is normally on-load and motorized for remote control.

To satisfy these requirements COET developed a modular line of Disconnecting panels which offers a very versatile and cost-efficient solution for different requirements.

COET can also offer a wide line of disconnecting cubicles for depot & track side for indoor & outdoor execution metal or fiberglass.

COET cubicles consist of one or more preassembled Metal or Fiberglass compartments. Each compartment is fully segregated against the adjacent ones to allow maintenance on individual disconnector, switch disconnector, incoming and outgoing cables whilst the other parts are energized.

Any fault of one component will be isolated thus not affecting other components.



LBS

Main Technical Data

	750 V	1500 V	3000 V
Nominal voltage U_N	750 V	1500 V	3000 V
Maximum permanent voltage	900 V	1800 V	3600 V
Maximum not permanent voltage	1 kV	1,95 kV	3,9 kV
Rated insulation voltage	1,8 kV	3 kV	4,8 kV
Rated impulse voltage			
— to earth and between the poles	15 kV	20 kV	40 kV
— across an isolating distance	18 kV	24 kV	48 kV
Industrial frequency voltage			
— to earth and between poles	6,9 kV	9,2 kV	18,5 kV
— on the disconnecting distance	8,3 kV	11 kV	22,2 kV
— auxiliary circuits	2 kV	2 kV	2 kV
Nominal current	up to 8000 A	up to 8000 A	up to 8000 A
Short-time withstand current	up to 85kA	up to 85kA	up to 85kA
Short-circuit current peak	up to 125kA	up to 125kA	up to 125kA

Main Components

Local control of disconnectors is always possible in safe way from Front Panel thanks to electrical and electromechanical interlocks made on purpose.

- Segregated compartment for each Disconnector and/or Load Break Switch and for each incoming/outgoing cable
- Withdrawable execution of disconnectors (OPTIONAL)
- Segregated Low Voltage compartment including protective relay and PLC for SCADA connection in cable or fiber optic
- Motor or manual operated Switches with manual emergency operation
- Main contact position visibility
- Voltage presence relays and surge arresters (OPTIONAL)
- Earth fault relay (F64) (OPTIONAL)
- Indoor or outdoor execution (up to IP66)
- Internal arc proof execution (53 / 75 kA for 250ms)

Traction Transformers

Cast Resin Traction Transformers

Tesar cast resin-insulated transformers can be used for different applications, such as power distribution, as converter solutions for industry, solar power plants and wind power plants, and for traction purposes. The eco design, which meets and exceeds all EU 548/2014 regulations, means we can support you on your way towards a sustainable future

More than 100.000 units running worldwide: this is the business card of Tesar. Since 1979, Tesar is in the market with its own Design, Quality and R&D, improving continuously. In 1983 Tesar was the first to study and test the fire condition behavior.

In 2004 Tesar was one of the very first manufactures worldwide to reach E2 C2 F1 qualification (Environmental, Climatic and Fire test) and in 2013 to qualify E3 condition for transformer installations in windmills. And still in 2014, ahead of the standard, the transformer electrical behavior after F1 fire test was successfully verified.

2014 ended with passing a test exceeding the C2 standards:

Storage and transport up to -50°C.

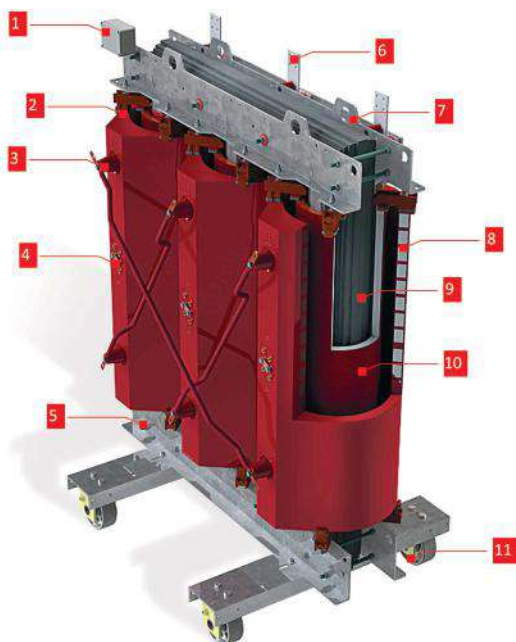
Rated power: 100 kVA to 20 MVA

Rated highest voltage: up to 52 kV

6-Pulse, 12-Pulse, 18-Pulse and 24-Pulse Rectifier transformers suitable for traction and industrial applications.



TRP



Description and Characteristics

1. Auxiliary terminal box
2. PT 100 or PTC sensors in the LV windings
3. MV connections
4. MV tap changer
5. Magnetic core frame
6. LV connections
7. Lifting eyes
8. MV windings
9. Magnetic core
10. LV windings
11. Carriage with bi-directional wheels

Watt White!

White...

Color of the beginning...

White, color of the purity, honesty and clarity...

Color of the stability and continuity, trust and quality...

Since 2010, we decided to apply white color which symbolizes all of these values to all of our products.



Headquarters

Bayraktar Blv. Şehit sk. No: 5 Aktif Plaza
34775 Ümraniye İstanbul / Turkey
Tel : +90 (216) 314 93 20
Fax : +90 (216) 314 93 60
www.aktif.net - info@aktif.net

Switchgear Factory

Akşemsettin Mh. Çatalca sk. No:113
06930 Sincan Ankara / Turkey
Tel : +90 (312) 269 46 02
Fax : +90 (312) 269 45 01
www.aktif.net - info@aktif.net

Resistor Factory

Pirahmetler Mh. D-100 Yanyol cd.
No:78/A Erenler 54200 - Sakarya / Turkey
Tel : +90 (264) 276 64 50
Fax : +90 (264) 276 64 52
www.aktif.net - info@aktif.net