

# **EN**hanced **TEC**hnology

Smart + Green + Human



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Want to be more than "the biggest"
We want to be "the best"



## **Company History**

Leading, challenge to make better tomorrow to open new road, the real leader..

Steps that Entec has made, was the history of explore and development for new land. From the power transmission and distribution industry, to Power IT, Metro & Railway and Nuclear industry, Entec has created and innovated to enormorous products to support the better services to the customer.

Standing on the top is not the last completion, it is the beginning of innovation for creation. Beyond the Korea, till the day of becoming the world best leader, Entec's challenge will go on.

2000's~2

Enhanced Technolog with continuous R and Developn

1996 DEC. 1996 Established in Anyang-city, Kyungki-do, KOREA by name of ENTEC electric & electronic Co., Ltd.

DEC. 1996 Established a affiliated research

tabul atul y.

DEC. Registration of supplier for Korea Electric Power Corporation

1997 FEB. 1997 Got the ISO 9001 quality system certificate by EAQA

APR. Trading Business Registration

JUN. Electric construction Type 1 license Acquisition

1998 MAY. Acquired the K.T(Korea new technology) mark from government for magnet actuator technology for the circuit breaker mechanism.

JUN. Development of pole mount SF6 gas insulated vacuum recloser.

JUN. Acquired the certificate of selection as a promising electric power venture enterprise by KEPCO.

OCT. Registered as excellent industry of industrial bank of Korea.

OCT. Venture Enterprise Award (The Small & Medium Business Administration)

1999 FEB. Acquired the a patent to the authorized Korea government with Overload Annunciator which has the records of maximum current in Transformer and Displaying device with alarm

1996's~1999's

Exploring the global

market with dreams

and passion

FEB. Acquired the a patent of Industrial New Design with Overload Annunciator Manufacturer

SEP. 15kV Auto Recloser Netherlands KEMA type test was successfully completed

 ${\bf NOV.}\ \ {\bf Moved\ to\ Wawoo-Ri,\ Bongdam-Eup,\ Hwaseong-City,\ Gyungki-Do,\ Korea}$ 

NOV. Acquired the Certificate of New Technology from the authorized government with SF6 Gas Insulated Vacuum Recloser. (Magnetic Actuator type)

NOV. Registered as standard model enterprise for technological development from the authorized Bank of Korea

- 2000 FEB. Registered as Excellent Enterprise for Competitive Technology from the authorized government.
  - APR. Type test of 750 & 1500V High Speed DC Circuit Breaker at CESI in Italy was successfully completed.
  - JUN. Acquired the a patent to the authorized Korea government with Circuit Breaker of contact closing mechanism and dual closing/opening mechanism
  - JUL. Type test of 38kV auto Recloser at CESI in Italy was successfully completed.
  - DEC. Registered as a promising company by Industrial Bank of Korea.
- 2001 MAR. Acquired the Certificate of Excellent Korean
  Technology from the authorized government
  with High Speed DC Circuit Breaker
  - APR. Registered as a promising company for export from the authorized government.
  - JUN. Registered as Excellent Enterprise for Competitive Technology from authorized government (Small & Medium Business Administration)
  - SEP. Large Interruption capacity of 38kV 16kA Auto Recloser Netherlands KEMA Type test was successfully completed
  - OCT. Acquired the a patent to the authorized Korea government with Wireless Current Meter.
  - NOV. INNO-BIZ Company Selection (Small & Medium Business Administration)



Running with global corporate

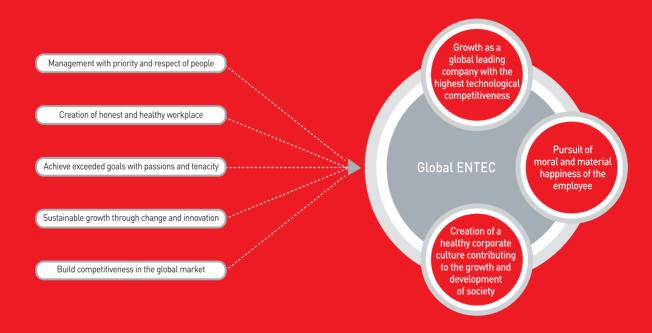
## 006's Corporate esearch

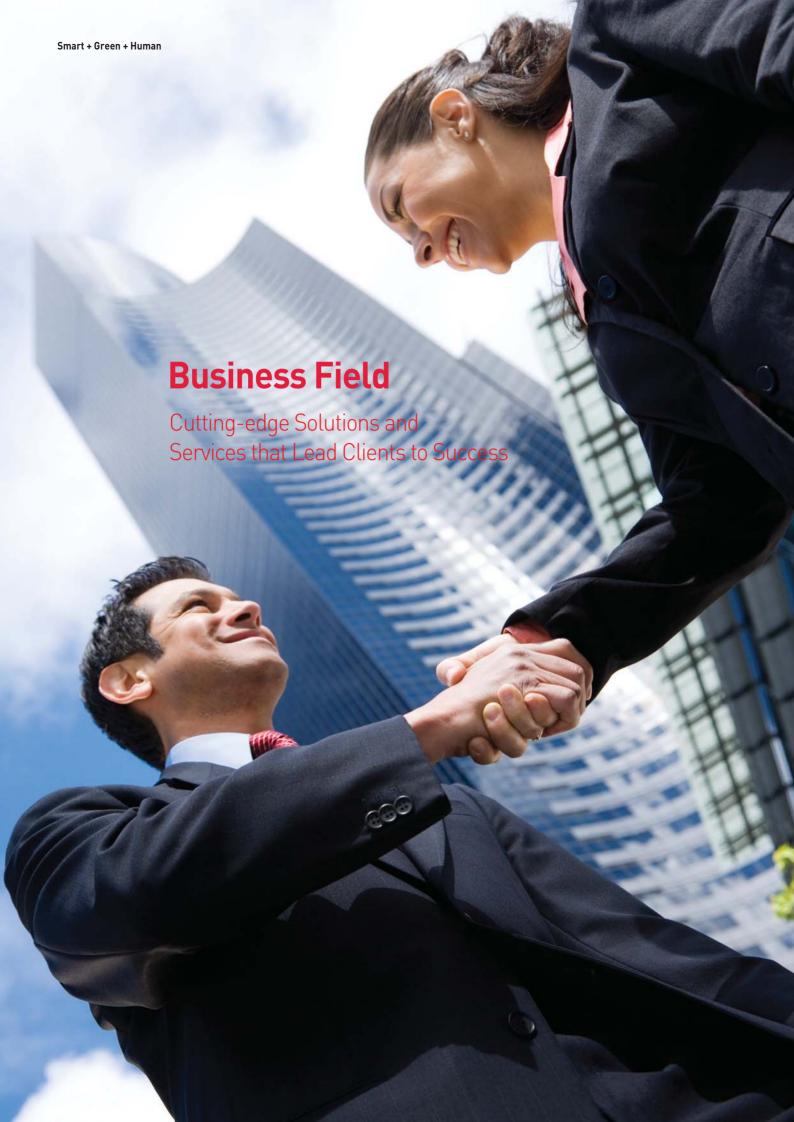
- 2002 FEB. Acquired the a patent of Industrial New Design with Enclosure of Pad mount product
  - JUL. A Promising Company Award (Ministry of Gyungki Province)
  - OCT. 27kV Solid Insulated Auto Recloser Netherlands KEMA Type test was successfully completed
  - DEC. Korean New Technology Authorization "KT Mark" Award DC Circuit Breaker, Interrupting small current by DC Blowout Coil
  - DEC. DC Circuit Breaker for Nuclear Power Plant in Italy CESI Type test was successfully completed
- 2003 MAR. Acquired the a patent of Design 4 Items Enclosure of Pad mount products
  - DEC. New Factory moving (Location; Buncheon-Ri, Bongdam-Eup, Hwaseong-City, GyungKi-Do)
    - DEC. Patent applied for Pole mount Solid Insulated Recloser/Load Break Switch
- 2004 JUN. Korean World-class Product Award 2004 Auto-Recloser Operated by Magnetic Actuator Mechanism
  - SEP. Acquired the a patent to the authorized Korea government for DC Circuit Breaker with small current interruption and Technology of small current interruption
- 2005 MAY. Certificate OF Advanced Technology Center from Ministry of Commerce Industry & Energy 25.8kV Solid Insulated Load Break Switch
- 2006 MAY . Patent 25.8kV Solid Insulated Load Break Switch
- 2007 AUG. KEPIC Quality Assurance Authorization achievement
  - DEC. Single PPM Certificate achievement
- 2008 JUN. 25.8kV Solid Insulated Switchgear(SIS) Type Test Pass at KERI
  - AUG. DC MCC vendor registered under Korea Hydro & Nuclear Plant Co., Ltd.
  - NOV. Best Quality Management Company Award(Power Distribution Line Equipment) by KEPCO
- 2009 AUG. KEPIC(Korea Electric Power Industry Code) AWARD GIS Vender register under KEPCO
  - NOV. 25.8kV Solid Insulated Switchgear(SIS) supplied to SEOUL METRO Substation
- 2010 MAY. Patent of Pole mount Solid Insulated Circuit Breaker & Load break switch
  - AUG. KEPIC Certification One-KEPCO Export Company Award Global Kangso enterprise award
  - OCT. Patent of Distribution equipment wireless control system and wireless control method Export Kangso Company Award
  - NOV. Patent of Electro Magnetic Actuator INNO-BIZ award
  - DEC. World Class Product Award KOREA 100 Technology Award [Korean type Power Distribution Automation and Distribution Automation Equipment Technology]
- 2011 JUL. Patent of Solid dielectric Pad mount Circuit Breaker & Load break switch Patent of Dye sensitized Solar Cell battery manufacturing method
  - OCT. Patent of Dye sensitized Solar Cell sealing system and method
- 2012 AUG. 27KV Solid Recloser Type Test Passed at CESI according to IEC62271-111
  - OCT. 24KV SF6 Gas RMU (Fuse type) Type Test Passed at KERI Solid Capacitor Switch Type Test Passed at KERI
- 2013 MAR. 25.8kV Solid Capacitor Switch Development
  - JUN. 12kV Solid Ring main Unit Development
- 2014 OCT. 17.5kV SF<sub>6</sub> Gas Ring Main unit Devlopment

### Whoever, Whenever, Wherever... **ENTEC** always by your side

On the street, at home, at work... Even today, ENTEC is meeting you always...

ENTEC has been leading the industry of substation and distribution line equipments, with infinitive challenge and passion as well as future generation technology and outstanding global person. You can meet the proud of ENTEC's growth and development in Power Distribution, Power IT, Metro & Railway and Nuclear Industries. With massive growth power, Entec will never rest to be the best of the best corporate.





### Closer to the customer and together, more convenient and happier for better life...

Power Distribution system solution to maximize the electricity efficiency and safety, Distribution Automation system solution integrated with Power IT, Intelligent system operation solution of Metro & Railway system. Now, environmentally friendly products solution for green energy! Your fresh and delight day will always be with Entec's humanism technology

•Solid Recloser •Solid Pad mount Load Break Switch •Gas Recloser ·Gas Pad mount Load Break Switch •Solid Load Break Switch •Auto Section Switch •Gas Load Break Switch •Solid Ring Main Unit(S.RMU) •Solid Pad mount Switchgear • Cubicle type Gas Insulated Switchgear(C-GIS) •Gas Pad mount Switchgear •Solid Insulated Switchgear(SIS) •SF6 Gas insulated Ring Main Unit(RMU) •Epoxy Insulated Fault Interrupter •Compact Secondry Substation •Solid Iusulated Capacitor Switch Power Transmission & Distribution •HSCB •DC Switchgear •DC Disconnector Switch •Silicon Rectifier **Business** •Q-Class DC circuit breaker Metro & Railway •ETCPU200 •DC Motor Control Panel **AREAS** •HMI •50F •Rail road Outdoor Circuit Breaker(EROCB-2) •Remote Terminal Unit •FVRC2A •EPGS1A •ETDCU100/200 •ETMFC104/106 •ETCPU200 •ECMS •FTR600R •Grid-connected PV PCS •ETCCD104 •ETR300R •HMI •ETDTS (3kV/50kV) •ETR300S •ETRTU104 •ETMFC303 •ET85R-3C/FX •ETR300i •Wireless Current Meter •ETCAP121 •ETCPU200TI •FTR30H Faulted Circuit Indicator •ETMFC50 •ETR20/20H •RTS2001 FTIMS •ETMFC101-N,N1 •ETR500F/M/T/D •ETR500F/T/G •RTS2010 •ETRTU101 •ETDR101 •ARGOS(RTU&SCADA) •ETHC-100 •ETRTU201 •ETIT-100 ALTS •ETR-102 •ETCPU200/300 •FVD-12N



## **Power Transmission & Distribution**

Solid dielectric equipments are widely developed not only Distribution line equipments but also Transmission line equipments, for instance, Solid Insulated Switchgear(SIS), Solid Insulated Recloser/Load break switch for pole mount and Solid Insulated Circuit Breaker and Load Break Switch. Solid dielectric technology provides the solution to protect

Environment from pollution by not using SF6 gas and Oil. And also enhances products safety.

With the reliable gas products know-how, Entec emphasize more on Environmentally friendly products in order to make Green Energy Network for the future.

### **Epoxy Insulated Fault interrupter** (EFI)



### Characteristics

- Epoxy Insulation & Vacuum Interrupter application
- Environmentally friendly interrupter
- Manual/Electrical Operation
- One shot open fault current interrupter

- mannigs	
Rated voltage	25.8kV
Rated current	400A
Rated breaking capacity	12.5kV
Rated making time	3 Cycles
AC Power frequency withstand voltage	60kV/1min. (dry)
Impulse withstand voltage	150kV BIL

### Solid Recloser



### Characteristics

- Environmentally friendly product
- Vacuum Interrupter
- Magnetic Actuator mechanism
- Maintenance free
- Intelligent Protection Relay
- Manual Open/Close Capability

### Ratings

•			
Rated voltage	15kV	27kV	38kV
Rated current	630/800A		
Impulse withstand voltage(BIL)	110kV 150kV 170kV		
AC Power frequency withstand voltage	50kV	60kV	70kV
Short time current	16kA	12.5kA	16kA
Making current	40kA	31.5kA	40kA

### Gas Recloser



### Characteristics

- Magnetic Actuator mechanism
- Vacuum Interrupter
- Intelligent Protection Relay
- Manual Open/Close Capability

### Ratings

Rated voltage	15kV	27kV	38kV
Rated current	630/800A		
Impulse withstand voltage(BIL)	110kV 150kV 170kV		
AC Power frequency withstand voltage	50kV	60kV	70kV
Short time current	12.5kA	12.5kA	16kA
Making current	31.5kA	31.5kA	40kA

### ECO Load Break Switch



### Characteristics

- Environmentally friendly product
- Vacuum Interrupter
- Spring Toggle mechanism
- Maintenance Free
- Intelligent Protection Relay
- Manual Open/Close Capability

Rated voltage	12kV	25.8kV	36kV
Rated current	630A		
Impulse withstand voltage(BIL)	125kV 150kV 170kV		
AC Power frequency withstand voltage	50kV	60kV	70kV
Short time current	20kA	12.5/16kA	12.5kA
Making current	40kA	32.5kA	32.5kA

### **Power Transmission & Distribution**

### Gas Load Break Switch



### Characteristics

- Puffer Principle mechanism
- Quick open and close operation

### Ratings

Rated voltage	15.5kV	25.8kV	36kV
Rated current	630A		
Impulse withstand voltage(BIL)	150kV 150kV 170kV		
AC Power frequency withstand voltage	50kV	60kV	70kV
Short time current	16kA	12.5/16kA	12.5kA
Making current	40kA	32.5kA	32.5kA

### **Auto Section Switch**



### Characteristics

• Coordination with upper stream circuit breaker or recloser

### Ratings

•	
Rated voltage	25.8kV
Rated current	400A
Rated short-time current	12.5kA (r.m.s), 1sec.
Rated making current	32.5kA (Peak)
Rated breaking current	880A

### **Solid Capacitor Switch**



### Characteristics

- Reactive power control capacitor switch
- Frequent trip purpose upto 3 phase, 3,200KVA

### Ratings

Rated voltage	27kV	
Rated current	200A	
Short time current	4.5kA, 1sec.	
Fault making current	15kA (Peak), 6kA (sym)	
Transient inrush frequency	6kHz	
Restrike class	C1	

### Solid Pad mount Switchgear



### Characteristics

- Environmentally friendly product
- Free from SF6 gas use
- Circuit Breaker Part : Magnetic Actuator Mechanism • Load Break Switch Part : Spring Toggle Mechanism

Rated voltage	12kV	25.8kV
Rated current	631	DA .
Short circuit making current	20kA	12.5kA
AC Power frequency withstand voltage	110kV	125kV
Impulse withstand voltage	50kV	60kV

### Gas Pad mount Switchgear



### Characteristics

- All circuit independent operation function
- 3 position Operation
- One life of dual contacts
- Remote operation available

### Ratings

Pated voltage	12kV	25.8kV
Rated voltage	IZKV	23.0KV
Rated current	63	0A
Short circuit breaking current	12.5kA	12.5kA
Short circuit making current	12.5kA	12.5kA
AC Power frequency withstand voltage	110kV	125kV
Impulse withstand voltage	50kV	60kV

### Solid Pad mount Load Break Switch



### Characteristics

- Spring Toggle Mechanism
- Environmentally Friendly Solid Dielectric Application

### Ratings

<u> </u>		
Rated voltage	12kV	25.8kV
Rated current	630A	
Short circuit making current	20kA	12.5kA
AC Power frequency withstand voltage	110kV	125kV
Impulse withstand voltage	50kV	60kV

### Gas Pad mount Load Break Switch



### Characteristics

- All circuit independent operation function
- 3 position Operation
- One life of dual contacts
- Remote operation available

### Ratings

•		
Rated voltage	12kV	25.8kV
Rated current	63	0A
Short circuit making current	12.5kA	12.5kA
AC Power frequency withstand voltage	110kV	125kV
Impulse withstand voltage	50kV	60kV

### SF<sub>6</sub> Gas Insulated Ring Main Unit(Extensible)



### Characteristics

- Spring charged Mechanism
- 3 Cycles interruption Capability
- Self-Powerd Relay(ETR 20) and Digital Relay

Item	SW/CB/FUSE	SW/CB/FUSE
Rated voltage	12kV	24kV
AC Power frequency withstand voltage	28kV	50kV
Impulse withstand voltage	95kV BIL	125kV BIL
Rated current	630A	630A
Breaking capacity -Short circuit breaking current -Making capability	- / 16kA / - 52.5kA/12.5kA/ 40kA	- / 16kA / - 52.5kA/12.5kA/ 40kA

### **Power Transmission & Distribution**

### SF<sub>6</sub> Gas Insulated Ring Main Unit(RMU)



### Characteristics

- Spring Charged Mechanism
- 3 Cycles interruption Capability
- Self-Powered Relay (ETR20)and Digital Relay

### Ratings

Item	SW/CB	SW/CB/FUSE
Rated voltage	17.5kV	24kV
AC Power frequency withstand voltage	50kV	50kV
Impulse withstand voltage	110kV BIL	125kV BIL
Rated current	630A	630A
Breaking capacity -Short circuit breaking current -Making capability	21kA / 21kA 54.6kA / 54.6kA	16kA / 25kA 40kA / 40kA

### Solid Dielectric Fused Ring Main Unit [Non-extensible]



### Characteristics

- Environmentally Friendly Solid Dielectric Application
- Convenient extension by modular structure
- High Reliability of breaking
- Improved Safety by double layer case
- Compact size and easy installation
- Various compose with LBS, FUSE and CB.

### Ratings

<u> </u>						
Classification	SW	CB	FUSE	SW	СВ	FUSE
Rated voltage(kV)	12			25.8		
Rated frequency(Hz)	50/60		50/60			
Impulse withstand voltage(kV)	75		125			
AC Power frequency withstand voltage(kV)		28			60	
Rated current(A)	630	630	200	630	630	125
Rated breaking current(kA)	-	20	40	-	12.5/16	40
Rated making current(kA, peak)	52		32.5/41.6			
Rated short-time with stand current (kA, 4S)		20			12.5/16	

### Solid dielectric Ring Main Unit [Extensible]



### Characteristics

- Environmentally Friendly Solid Dielectric Application
- Convenient extension by modular structure Various compose with LBS,
- High Reliability of breaking
- Improved Safety by double layer case
- Compact size and easy installation
- FUSE and CB.

Rated voltage(kV)         12         25.8           Rated frequency(Hz)         50/60         50/60           Impulse withstand voltage(kV)         75         125           AC Power frequency withstand voltage(kV)         28         60           Rated current(A)         630         630         200         630         630         125           Rated breaking current(kA)         -         20         40         -         12.5/16         40           Rated making current(kA, peak)         52         32.5/41.6	• Ratings						
Rated frequency(Hz)         50/60         50/60           Impulse withstand voltage(kV)         75         125           AC Power frequency withstand voltage(kV)         28         60           Rated current(A)         630         630         200         630         630         125           Rated breaking current(kA)         -         20         40         -         12.5/16         40           Rated making current(kA, peak)         52         32.5/41.6	Classification	SW	CB	FUSE	SW	СВ	FUSE
Impulse withstand voltage(kV)   75   125     AC Power frequency withstand voltage(kV)   28   60     Rated current(A)   630   630   200   630   630   125     Rated breaking current(kA)   - 20   40   -   12.5/16   40   Rated making current(kA, peak)   52   32.5/41.6	Rated voltage(kV)	12			25.8		
AC Power frequency withstand voltage(kV) 28 60  Rated current(A) 630 630 200 630 630 125  Rated breaking current(kA) - 20 40 - 12.5/16 40  Rated making current(kA, peak) 52 32.5/41.6	Rated frequency(Hz)	50/60		50/60			
Rated current(A)         630         630         200         630         125           Rated breaking current(kA)         -         20         40         -         12.5/16         40           Rated making current(kA, peak)         52         32.5/41.6	Impulse withstand voltage(kV)	75		125			
Rated breaking current(kA)         -         20         40         -         12.5/16         40           Rated making current(kA, peak)         52         32.5/41.6	AC Power frequency withstand voltage(kV)	28		60			
Rated making current(kA, peak) 52 32.5/41.6	Rated current(A)	630	630	200	630	630	125
3	Rated breaking current(kA)	-	20	40	-	12.5/16	40
Rated short-time withstand current(kA,4S) 20 12.5/16	Rated making current(kA, peak)	52		32.5/41.6			
	Rated short-time withstand current(kA,4S)	20		12.5/16			

### **Compact Secondary Substation** (CSS)



### Characteristics

- Public Friendly designed
- Compact size of substation
- Epoxy Insulation
- Permanent Magnetic Actuator Mechanism for Circuit Breaker
- Spring Toggle Mechanism for Load break switches
- Vacuum Interrupter

### Ratings

Item	Circuit Breaker	Load break switch
Rated voltage	25.8kV	25.8kV
Rated current	630A	630A
AC Power frequency withstand voltage	60kV/1min.	60kV/1min.
Impulse withstand veltage	125kV BIL(Main)	125kV BIL(Main)
Impulse withstand voltage	150kV BIL(Earth)	150kV BIL(Earth)
Rated short circuit current	12.5kA	12.5kA

### Solid Insulated Switchgear(SIS)



### Characteristics

- Single/Double busbar system
- Environmentally friendly product
- Solid Dielectric application
- Magnetic Actuator mechanism
- Various types of relay applicable
- Enhanced safety(short-circuit free) by moulding individual inner structure.
- Fire retardant
- Interlock system between CB, DS, ES and Relay

- Close Loop System(CLS) :
- -Fault acknowledgement by signaling in fiber optic communication(Peer to peer)
- -No remote operation required(Close Loop Algorithm operation)
- -Quick management in closed loop system. : ETMFC106 Protection Relay Provision CLS.

### Ratings

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Rated voltage	7.2kV	15kV	25.8kV	40.5kV
Rated current	630A	630/ 1250A	630/1250/ 2000A	630/ 2500A
Interruption current	12.5kA	12.5kA	25kA	31.5kA
Duty	0-0.3s-C0-15s-C0			

### Cubicle type Gas Insulated Switchgear (CGIS)



### Characteristics

- Permanent Magnetic Actuator mechanism
- Maintenance free (10,000 times operation)
- Cubicle type GIS
- Gas pressure monitoring device and over voltage release device application

Classification		Rating
Rated voltage		25.8 kV, 3 Phase
Rated frequency		60 Hz
AC Power frequency	Phase-Ground	70 kV / 1 min
withstand voltage	DS Phase-Phase	77 kV / 1 min
Impulse withstand Phase-Ground		150 kV / 1.2 ×50 µsec
voltage	DS Phase-Phase	165 kV / 1.2 ×50 μsec
Control and operati	ion circuit withstand voltage	2 kV / 1 min
Rated short-time	Effective value(r.m.s)	25kA / 1 sec
current	Max. Peak value	65 kA, Peak
Data d accurant	Main busbar and 2000A circuit	2000 A
Rated current  Distribution line and 600A circuit		600 A
Rated gas pressure	e / Alarm pressure	0.03 / 0.015 MPa.G at 20 °C
Control and operati	ion circuit voltage	DC 125 V / AC 220 V



## **Metro & Railway**

Korea first manufacture of 1800V/900V DC Switchgear becomes major supplier in Korea as Domestic metro system gets developed and extended. Technical capability and its reliability were attested at KERI in Korea and at IPH in Germany. Entec provides DC Power System protection with High Speed Circuit Breaker which uses magnetic actuator mechanism and it operates with digital relay and HMI. DC disconnector is also

interactive with DC HSCB for user safety.
Various type of silicon rectifier can be fit with any specification.
As Environment Protection issue gets attention, Public transportation also gets attention in order to decrease air pollution by maximizing public transportation. It is one of the important key to protect environment from pollution by using Metro system as public transportation.

### DC Switchgear



### Characteristics

- High quality DC High Speed Circuit Breaker(HSCB) and DC Disconnector application.
- Compact design
- Digital Protection relay system application.
- Absolute Insulation capability
- Convenient Circuit Breaker Withdraw
- Fire retardant
- Interlock between CB, Disconnector, Relay and Panel
- SMBA Excellent product

• ·············			
Model	ETGR 21	ETGR 22	
Nominal voltage	DC 750[V]	DC 1,500[V]	
Rated voltage	DC 900[V]	DC 1,800[V]	
Insulation voltage	DC 1,800[V]	DC 3,000[V]	
Rated interrupting over voltage	1.5~2 ×rated voltage		
Rated current	4,000 / 5,000 / 6,000 [A]		
Rated making and breaking capacity	133[kAp]/91.2[kA]	110[kAp]/76.8[kA]	
Operation duty	0-15sec-C0-15sec-C0-60sec-C0 (max fault, max energy, distant fault)		
di/dt (Current rising rated vs time)	24.2 X 10 <sup>6</sup> [A/S]	25.2 X 10 <sup>6</sup> [A/S]	
Mechanical durability	20,000	) times	
AC Power frequency withstand voltage(60[Hz], 1min.)	5.5[kV]	11[kV]	
Rated operation, control voltage	DC 110[V]		
Over vurrent release Pick-up	5~12[kA]		
Max. Ambient temp / Avg. Temp.	40[°C]/35[°C]		
Altitude	≤2,0	00[m]	

### High Speed Circuit Breaker (HSCB)



### Characteristics

- High Durability and Reliability
- Magnetic Actuator Mechanism
- Sufficient electric current capacity and Heat withstand
- High Insulation capability
- Quality Assurance • Compact design
- KT Mark
- Panel interface
- Enhanced small current interrupting capability

### Ratings

•			
Model	ETGR 21	ETGR 22	
Nominal voltage	DC 750[V]	DC 1,500[V]	
Rated voltage	DC 900[V]	DC 1,800[V]	
Insulation voltage	DC 1,800[V]	DC 3,000[V]	
Rated interrupting over voltage	1.5~2 ×rated voltage		
Rated current	4,000 / 5,000 / 6,000 [A]		
Rated making and breaking capacity	133[kAp]/91.2[kA]	110[kAp]/76.8[kA]	
Operation duty	0-15sec-C0-15sec-C0-60sec-C0 (max fault, max energy, distant fault)		
di/dt (Current rising rated vs time)	24.2 X 10 <sup>6</sup> [A/S]	25.2 X 10 <sup>6</sup> [A/S]	
Mechanical durability	20,000	) times	
AC Power frequency withstand voltage(60[Hz], 1min.)	5.5[kV]	11[kV]	
Rated operation, control voltage	DC 110[V]		
Over current release Pick-up	5~12[kA]		
Altitude	≤2,000[m]		

### **DC Disconnector Switch**



### Characteristics

- High durability and reliability
- Fast closing and opening time
- Complete insulation durability and electric current capacity
- Compact design
- Electric & Manual operation
- Various installation type

### Ratings

Model		ET-DS
Nominal voltage		DC 750[V] / DC 1,500[V]
Rated voltage		DC 900[V] / DC 1,800[V]
Rated current		2,000 / 3,000 / 4,000 / 5,000 / 6,000[A]
Rated short time cur	rent	110[kAp]/75[kA]
Operation voltage		DC 110[V]
Operation method		Electrical/Manual
Mechanical durability	1	100,000times
Operation time		below 2sec
	Phase-Phase	AC 11[kV/min]
Insulation voltage	Phase-Ground	AC 9.2[kV/min]
	Control circuit	AC 2[kV/min]

### Solid insulated Railway Outdoor 2 Pole Circuit Breaker(EROCB-2)



### Characteristics

- Environmentally friendly product
- Railway outdoor substation application
- Maintenance free

- Vacuum Interrupter (30 times of short circuit capability)
- Electro Magnetic Actuator (EMA)

• Natiligs	
Insulation method	Solid dielectric
Rated voltage	31.5kV
Rated current	2000A
Rated breaking current	31.5kA
Mechanical durability	10,000times
AC Power frequency withstand voltage	140/90kV/min
Impulse withstand voltage	325/185kV

### **Metro & Railway**

### Silicon Rectifier



### Characteristics

- Various type (2,000/3,000/4,,000/5,000kW)
- 6 pulse or 12 pulse design
- Disk type silicon diode apply
- Compact design
- Duty Class VI
- · Current deviation and efficiency
- Fault handling in each module
- Real time temperature monitoring
- Information acquisition function(HMI)
- Report function
- PPS Excellent product
- SMBA Excellent product

### Ratings

Model	ETSR 21	ETSR 22	
Rated input voltage	AC 300V(600V)	AC 600V(1,200V)	
Rated output voltage	DC 750V	DC 1,500V	
Rated watt	1,000/2,000kW	2,000/3,000/4,000kW	
Rated current	1,333/2,667A	1,333/2,000/2,667A	
Rated frequency	60	Hz	
Duty class	> Class VI (H	eavy Traction)	
Rated overload	100% continuous - 150% 2hours - 300% 1m (Class VI)- [150% 23min 300% 1min.] X4times repeat		
Input system	Rectifier Tr ( 🛆	√△ or △/△-Y)	
Output coefficiency	6P or 12P		
Cooling method	Self-cooling method		
AC Power frequency withstand voltage (60Hz, 1 min.)	2,350V	4,140V	
Diode type	Sili	con	
Diode Max. Unbalance current	<1	10%	
Load efficiency	>99%		
Max. Noise standard	<60dB		
Rated control voltage	DC	110V	
Max. Ambient temperature/Aver.	\(\O \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \	ມ°ດ / 25°ດ	
Temperature(day)/Aver. Temperature(Year)	40 ( / 3	0 (720 (	

### **Human Machine Interface**



ETCPU200 HMI is a device to manage the ETCPU200 locally or remotely. ETCPU200 HMI separated from the ETCPU200 obtains data via communication so that one HMI can manage several the ETCPU200.

The graphic LCD of large size allows of easily accessing intuitive and various information. The setting point change and the circuit breaker control are performed through authentication procedure of password.

### Graphic LCD

- 240 X 128 dot resolution
- Chinese, Korean and English fonts
- Representation of the single-line diagram of the system and several types of figures
- CCFL Backlight power-saving function

### Program Port

• Port for interfacing with PC Application Software

### LED Display

- Indicates the state of connected devices
- Six user-defined LED

### Key Board

• Operates the HSCB, changes the set point and views the saved event











SINGLE-LINE DIAGRAM AND CONTROL

S

STATUS

### Protection IED ETCPU200/300



#### Characteristics

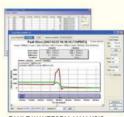
- Metering : Current(Feeder, Compensation, Termal), Positive/Negative Power, Energy Voltage(Feeder, Rectifier, Diff' Voltage)
- Recording function: System, Diagnostic, Operation and Fault Event, Fault Wave, Load Profile
- PLC function
- Multi communication protocol: DNP3.0, MODBUS, IEC60870-5-101/104, IEC61850(ETCPU300)
- Control: Interconnecting Relay(85F), DC Reclosing(82), Line Test(LT)
- Protection : di/dt, △I/ △VI, Over Current(76D), Reverse Current(32), Under Voltage(80), Over Voltage(45), Diff' Voltage, Thermal Protection(26F), Ground Protection (64D), Frame Leakage Protection

### Interface Software (ETIMS)









SETTING

**FAULT WAVEFORM ANALYSIS** 

### **Network Application**

DC Protection relay provides effective and flexible communication environment for local or remote supervisory control. One data concentrator(ETDCU100/200) can establish a network system, based on the Ethernet, including maximum 24 ETCPU200/300.



- Monitor
- Measurement
- Control



### **Device Management at Branch Office**

- Program for Window OS Connection device information View
- Various Event View & Records
- Setting change
- PLC Management
- Communication Map Configuration
- Fault waveform analysis function
- · Collected data and event management

### **SUBSTATION**

### **Device Management at local**

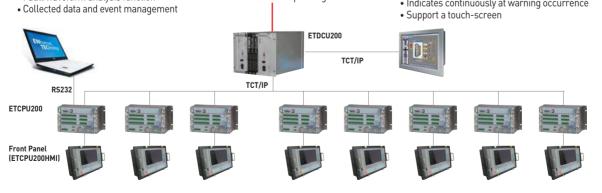
- · Used in a field if necessary
- Program for Window OS
- Connection device information View
- Various Event Views & Records
- Setting change
- PLC Management
- Communication Map Configuration
- Fault waveform analysis function

### **Data Communication Unit**

- Decrement of communication load on high-level communication system
- Increment of system reliability due to duplicate-organization (optional)
- Multiple protocol(IEC61850, DNP, MODBUS, IEC60870-5-101/104)
- Support Master / Slave Dual-mode • Communication Map Configuration

### Device Management at Substation (HMI)

- Excellent environmental performance with using commercial PC
- Increment of legibility by colorized state information indication
- Graphical Indication of the measuring data (Indication displaying graphically the measuring data)
- Monitoring communication state
- Indicates continuously at warning occurrence



### **Power IT**

Distribution Automation System provide rapid Electricity Network management and also support Smart Grid. Entec provides various types of Protection relays and Control panels for Recloser, Switch and Circuit Breaker. Some of controllers and protection relays are built up with RTU for Distribution Automation System application. RTU built-in controllers and protection relays provide more efficient operation and enhanced System Control in Distribution Line.

### **Distribution Automation System (DAS)**

### **Overhead Line**



### ETR600-R

Circuit Breaker Protection Relay (Recloser/Subsation Circuit, etc.)

- 51, 50, 46, 67, 27, 59, 81, 25, 79, CLPU, etc.
- Multi Communication Protocol : DNP3.0, MODBUS, IEC 60870-5-101/104 and IEC 61850
- PLC, PQM, GPS, IRIG



### ETR300-R

Automatic Recloser Protection Relay (RTU Built-In)

- 51, 50, 46, 67, 27, 59, 81, 25, 79, CLPU, etc.
- Multi Communication Protocol : DNP3.0, MODBUS, IEC 60870-5-101/104
- PLC, PQM, GPS, IRIG, Fault Locator, Contact Wear Monitor, Loop Control



### ETR300-S

Automatic Load Break Switch Controller (RTU Built-In)

- FI(Fault Indicator) Function
- Open Phase, Live Load Block, Synchro. Check, etc.
- Loop Control Function (Auto Sectionalizer & Tie Point Switch)
- Multi Communication Protocol : DNP3.0, MODBUS, IEC 60870-5-101/104
- PLC, PQM, GPS, IRIG



### EVRC2A-NT

Automatic Recloser Protection Relay (RTU Built-In)

- 51, 50, 46, 67, 27, 59, 81, 25, 79, CLPU, etc.
- Multi Communication Protocol : DNP3.0, MODBUS, IEC 60870-5-101/104
- PQM, GPS, IRIG, Fault Locator, Contact Wear Monitor, Loop Control, SMS



### ETCAP121

Capacitor Switch Controller (RTU Built-In)

- Auto/Manual Capacitor Control
- VAR/Volt/Time Control
- Multi Communication Protocol : DNP3.0, MODBUS and IEC 60870-5-101/104



### ETMFC101-N1

Multi-Function Relay (RTU Built-In)

- FI(Fault Indicator) Function
- Open Phase, Live Load Block, Synchro. Check, etc.
- Loop Control Function (Auto Sectionalizer & Tie Point Switch)
- Multi Communication Protocol : DNP3.0, MODBUS, IEC 60870-5-101/104
- PLC, PQM, GPS, IRIG, SMS



### ETRTU101

Distribution Automation Remote Terminal Unit for Load Break Switch

- FI(Fault Indicator) Function
- Open Phase, Live/Dead Line, Phase Unbalance, Fault Directional Detect
- DNP3.0 Communication Protocol

### Overhead Line



### ETRTU201

Distribution Automation Remote Terminal Unit for Load Break Switch

- FI(Fault Indicator) Function
- SOE, COS, VOC and PLC Function
- DNP3.0 & MODBUS Communication Protocol



### ETMFC50

Multi-Function Controller for Auto Sectionalizing Switch and Fault Interrupter

- 51, 50, Sectionalizer Function, Overcurrent Lock Function and Contact Wear Monitor
- Programmable SCADA I/O port



### ETR300i

Integrated Distribution Automation Remote Terminal Unit for Load Break Switch

- FI(Fault Indicator)
- Loop Control Function
- Multi Communication Protocol: DNP3.0, MODBUS, IEC 60870-5-101/104
- PLC, PQM, GPS, IRIG

### **Under Ground Line**



### ETR-102

**Dual Protection Relay** (Two Circuit Breaker Protection Relay)

- OCR(51,50,46,CLPU) × 2
- Demand Trip, Contact Wear Monitor
- MODBUS Communication Protocol
- Programmable SCADA I/O port



### ETMFC104

Multi-way Circuit Breaker(Pad type) Controller(4Way) Multi-way Circuit Breaker(Pad type)

- 51, 50, 46, 27, 59, 25, CLPU, etc.
- Circuit Type Selection (Switch or CB)
- Multi Communication Protocol: DNP3.0 and **MODBUS**
- PLC. PQM



### ETMFC106

Controller(6Way)

- 51, 50, 46, 27, 59, 25, CLPU, etc.
- Circuit Type Selection (Switch or CB)
- Multi Communication Protocol: DNP3.0 and MODBUS
- PLC, PQM



### EPGS1A

Multi-way Load Break Switch Controller(Pad type)

- Controlling, Measuring and Monitoring Function at site
- Remote Control Function (using RTU)



### ETCCU104

Multi-way Circuit Breaker Controller for Closed-Loop System(Pad type)

- 51, 50, 46, 27, 59, 25, CLPU, etc.
- Closed/Opened Loop System Operation Function
- Self Healing Protection
- Multi Communication Protocol: DNP3.0, MODBUS and IEC 60870-5-101/104



### ETRTU104

Distribution Automation Remote Terminal Unit for Load Break Switch(Pad type)

- FI(Fault Indicator) Function
- Open Phase, Live/Dead Line, Phase Unbalance, Fault Directional Detect
- DNP3.0 Communication Protocol



## **Power IT**

### **Distribution Automation System(DAS)**

### **Under Ground Line**



### ETMFC303

Compact Secondary Substation Protection Relay

- 51, 50, 67, 27, 79, etc.
- Remote and Site Protection, Controlling and Monitoring Function
- Multi Communication Protocol : DNP3.0, MODBUS and IEC 60870-5-101/104



### ETR30H

Multi-way Circuit Breaker(Pad type) Controller(4Way)

- 51, 50, 67, 27, 79, etc.
- Remote and Site Protection,
- Circuit Type Selectable (Switch or CB)
- Multi Communication Protocol : DNP3.0, MODBUS and IEC 60870-5-101/104



### **ETAT100**

Auto Load Transfer Switch Controller

- Transition Suppressor Function for Momentary Power failure, Load-Side Momentary Failure
- Controlling and Monitoring Function Protection Function for Load-side

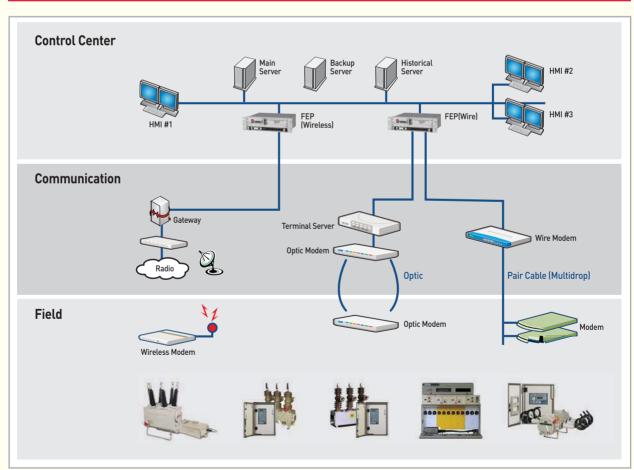


### ETR20

Overcurrent Protection Relay for RMU

- Self Power
- OCR(51P, 50P, 51N, 50N) Protection

### **DAS System Diagram**



NOTE) FEP: Front End Processor, HMI: Human Machine Interface

### **ARGOS (SCADA & ETRTU 3000)**

'ARGOS' that can be applied to a variety of power system is for monitoring and control according to changes in the power plant site. Main features are monitoring, control, alarm processing, recording, report. Argos is an integrated monitoring and control system and designed for the remote control and protection system in the field of distribution. It is designed as an open system to be compatible with the communication standard of the international standard widely used in industry.

### Main Features

### Availability

- Information can be modified by using easily managing editor, administration system in accordance with the purpose.
- Users can check the status of field devices in real time through a variety Viewer.
- Simple setup and protocol conversion is possible and can be used for various types of system.

### Stability

- This prevents the loss of information and the download time in an emergency through the 'ARGOS DC'.

#### Flexibility

- ARGOS operates without any restriction in Windows Version.
- Users can change the environment by setting a simple configuration.

### Communication

- DNP 3.0 / IEC 60870 / IEC 61850 / MODBUS
- Modem / Fiber Optic / Ethernet / RS422 / 485





- 7,000 times of DI / DO / AI Point

### Remote monitoring, control and Measuring

- Circuit Breaker Open/Close
- SOE (Sequence Of Event) Information
- Remote measurement of voltage, Active/Reactive Power, frequency, power factor

- System Monitoring & System Function Test & System, Equipment history management
- Database Create, modify, store, edit and manage

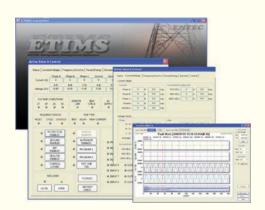
### Usage

- ETRTU3000 monitors power equipment such as substations, metro, railway, water and sewage systems and other industrial equipment. Also, it transmits information to the power plant connected with various communication interfaces and standard protocols as SCADA. The system has reliability in configuring a redundancy-system.

### Power IT

### **Distribution Automation System (DAS)**

### Interface Software (ETIMS)



### ETIMS - Interface Software

Interface Software for Setting configuration, monitoring and controlling for Distribution Automation System device. Various events and data management for user convenient.

#### Feature

- Monitoring elements settings, System settings, Protection elements settings
- Sytem history, Diagnostics, Load profile, Fault recording, Fault waveform confirmation
- Communiction protocol Map cafiguration
- Remote control and the check of measurement values
- Three levels password system for communication and data security

Overhead line protection relays and underground line protection relays can bemanaged by ETIMS

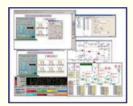
### **SCADA**



### Remote Terminal Unit(RTU)

Remote Monitoring, Measuring and Controlling Device for Power System Operation Facility

- Power Plant, Substation Installation
- Real Time Operating System
- Multi-Host(LAN port, Serial port), Multi- Protocol(DNP3.0, MODBUS and IEC 60870-5-101/104)



### **Electrical Equipment Control & Monitoring** System(ECMS)

- Real Time Operating System
- System Standard Time Synchronization, Remote Monitoring, Intelligent System and System Management (DB, Event, Management, etc)
- Multi-Host(LAN port, Serial port), Multi-Protocol(DNP3.0, MODBUS and IEC 60870-5-101/104)

### Renewable Energy



### ETPCS(Inverter)

Grid-connected PV PCS(3kW, 50kW)

- Maximum Power Point Tracking(MPPT)
- Protection and Diagnosis Function
- Hi-Efficiency, User-Friendly Interface

### Nuclear Power Plant MCCB Protection Relay IEC61850 Based Protection Relay







DC Overcurrent Protection Relay

- Q-Class Protective Relay
- OCR, OCGR Protection
- Available NuclearPower Plant MCCB Pannel



### ETR500 F/M/T/D

Protection IED(Intelligent Electronic Device) for Feeder/Motor/ Transformer/Distributed Generator

- 51, 50, 46, 67, 27, 59, 81, 25, 79, CLPU, etc.
- Graphical LCD : Graph/Single-Line Diagram and Multi-Language Support
- Multi Communication Protocol: DNP3.0, MODBUS and IEC 60870-5-101/104, IEC61850

### Metro & Railway Protection and control



#### ETCPU200

DC Protection Relay

- Frame Leakage, di/dt and  $\Delta I/\Delta VI$  protection, 76D, 32, 80, 45, 26F, 64D, 85F, 82, Line Test, etc.
- DNP3.0 and MODBUS Communication Protocol
- PLC Function



### ETCPU200 HMI

Human Machine Interface for DC Protection Relay

- Graphic LCD 240 ×128 dot
- Multi-Language Support (English, Korean, Chinese, etc.)
- Single-Line Diagram Support



### ETDCU100

Data Concentrator Unit

- Max Device 10 EA
- Communication Map Configuration
- Programmable SCADA I/O port
- Multi Communication Protocol: DNP3.0, MODBUS and IEC 60870-5-101/104, IEC61850



### ETDCU200

Data Concentrator Unit

- Max Device 24 EA
- Communication Map Configuration
- Higher System Reliability by Duplex Configuration (Optional)
- Multi Communication Protocol: DNP3.0, MODBUS and IEC 60870-5-101/104, IEC61850



### **ETDTS**

Data Transfer System

- Communication relay for Substation
- High-Capacity Communication Relay, Programmable SCADA I/O port
- Increase System Reliability by Duplex Configuration(Optional)
- SIO 8ch.(4 ports per Channel)
- Multi Communication Protocol: DNP3.0, MODBUS and IEC 60870-5-101/104, IEC61850



### IHMI

Human Machine Interface for DC Substation Automation System

- PLC, Touch Screen and Multi-Language Support
- Multiple Device Connection through Ethernet and
- Multi Communication Protocol: DNP3.0. MODBUS and IEC 60870-5-101/104, IEC61850



### ET85R-3C/FX

Interconnection Relay for DC Switchgear

- Single-Directional Relay: Remote Signal Transfer Function



### ETCPU300

Selectively Interrupting Protection Relay

- DC Traction Ungrounded Selective Protection Relay
- Graphic LCD: Graph/Single-Line Diagram and Multi-Language Support
- Remote and Site Protection, Controlling and Monitoring Function
- Multi Communication Protocol : DNP3.0, MODBUS and IEC 60870-5-101/104, IEC61850
- PLC Function



### ETCPU300C

- Frame Leakage, di/dt and  $\Delta I/\Delta VI$  protection, 76D, 32, 80, 45, 26F, 64D, 85F, 82, Line Test, etc.
- Graphic LCD: Graph/Single-Line Diagram and Multi-Language Support
- Multi Communication Protocol : DNP3.0, MODBUS and IEC 60870-5-101/104, IEC61850
- PLC Function



### **Power IT**

### **Others**



### **Faulted Circuit Indicator and Target**

Fault Current Detector and Fault Location Indicator for Underground Transmission, Distribution Line

- Tripping Current : 3~5 Times of Load Current (Min. Pickup 300A)



### ETCPU200 TI

ETCPU200 Simulator

- ETCPU200 Operation Check by DC System Fault Simulation
- Fault Simulation Generator



### Wireless Current Meter (WCM)

Pole Transformer Load Current Measurement from ground

- Range: 1~1600A
- Wireless Transmit Receive distance : 20m







### ETR20H

Overcurrent Protection Relay for RMU

- Self Power
- OCR(51P, 50P, 51N, 50N) Protection

### RTS2010

Relay Test Device(OCR, OCGR, DOCR, DOCGR, OVR, UVR and Reclosing Relay, etc.)

- Optimized Relay Testing Device
- Max 1.5Arms ×3ch., Max 7Vrms ×4ch.
- Moment Output, Harmonic Output Power, Ramp Function, OCR Function and Sequence Function

### EVD-12N

Live Line Voltage Detector

- 15kV, 27kV, 38kV
- AC 3-Phase Voltage Detection, Lamp Indication (Flash)
- Operational without Power Supply



### ETHC-100

**Humidity Controller** 

- Range : 20~95%
- Accurate Humidity Measurement by Insulator Humidity Sensor
- Automatic Humidity Control



### ETIT-100

Isolation Transducer

- 1500Vac Dielectric Strength
- 0.5% Tolerance, Rapid Reaction Time



### **ETIO10**

External I/O Unit

- Stand alone or Interface with  $\ensuremath{\mathsf{ETR300R}}$
- Input 12ch.(250/125/48/24/12Vdc)
- Output 8ch.(300Vac/350Vdc)

## **Nuclear Power Plant Equipment**

Nuclear Power Plant is one of the major electricity generation plants. High quality with outstanding performance products is required from excellent companies. Entec provides DC Motor Control panel and its Q-Class DC Circuit Breaker to Motor Control Centre in Nuclear Power Plant.

### Q-Class DC Circuit Breaker



### Characteristics

- Withdrawable type panel application
- Spring charge mechanism
- Micro-processor based Digital Protection Relay
- Q-class certified
- Motor Control Circuit Breaker
- CESI and KERI type tested

### Ratings

Model	ET	NB	
Туре	E1600-Q(Class-1E) E1600-Q-N(NON Class-		
Maximum Voltage	DC300[V]		
Rated Voltage	DC250[V]		
Rated Current	1600[A]		
Frame Current	800[A], 1600[A]	800[A], 1600[A]	
Rated making current	83P / 50[kA]		
Number of pole	2		
Operation Duty	0-15sec-C0		
Operation Method	Spring Charge Operation		
Control Voltage	DC125/250[V]		
Interruption medium	Air bre	eaking	
Trip Device	Digital OCR(ETDR-101)		
Auxiliar Contact	4a,2b,(external) Capacity: 30A/250VAC, 20A/125VDC		
Trip status	1a,(external) Capacity: 8	A/250VAC, 0.2A/300VDC	

### DC Motor Control Panel



### Characteristics

- High Interruption capacity[50kA]
- Durability min. 4850 times of no load operation and 500[1,600A]/1750[800A] times of load operations: Spring charged mechanism
- Seismic Qualification
- Nuclear Power Plant DC motor control panel

Model	DC motor controller
Туре	ETMC-A,B,C,D
Max. Voltage	DC 300[V]
Rated Voltage	DC 125/250[V]
Rated Current	1600[A]
Frame Current	800/1600[A]
Rated making and breaking capacity	83p/50[kA]
Composition	Circuit Breaker Level 1, 2, 3 stack
Control Voltage	DC 125/250[V]
Operation method	Manual Spring Operation
Circuit Breaker type	Drawer type
Breaking method	Air Breaking
Trip Device	Digital OCR, Manual

ENhanced TEChnology Smart + Green + Human

