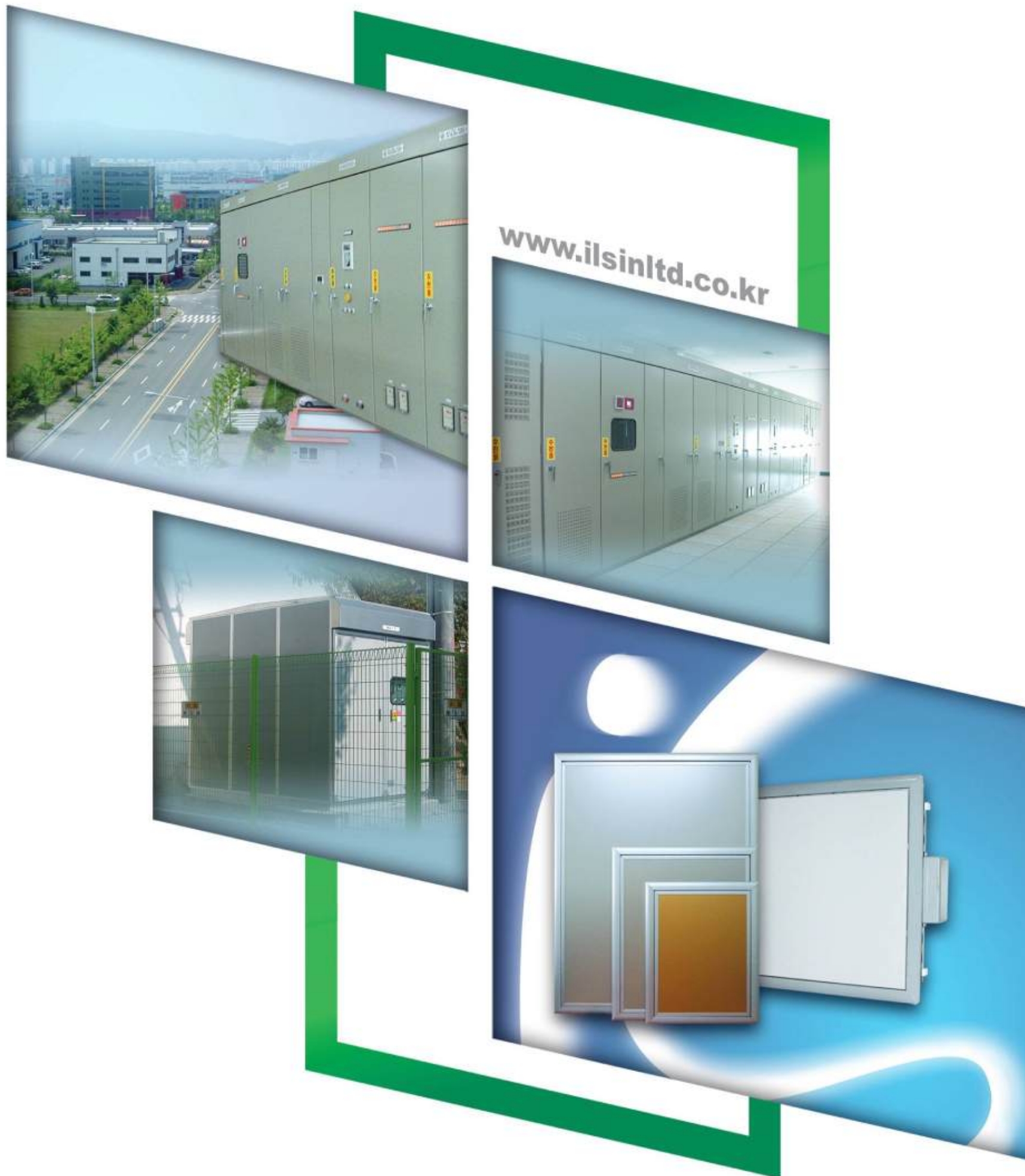


Electrical panel of thermal circulation with eco-friendly natural convection, explosion-proof, and earthquake-resistance

Smart distribution panelboard/household terminal box



Manufacturing electrical panels of / heat circulation with natural convection / heat insulation material
Green technology certification, green product verification



주식회사 일신전기

IL SIN ELECTRIC MACHINERY CO., LTD

History

Company History



Year	Contents
1987.06.15	Daegu-Gyeongbuk branch of Kookje Electric Co., Ltd. opened
1987.11.20	Established IL SIN ELECTRIC MACHINERY
1989.05.04	Acquisition of electric construction business
1995.02.10	Established the corporation of IL SIN ELECTRIC MACHINERY CO., LTD
1998.10.20	Moved headquarters factory to 20-4, Sangyeok 2-dong, Buk-gu, Daegu
2001.01	Completed Youngnam Industrial Logistics Center
2003.06.17	Registered utility model for safety scaffolding for working on electric poles with insulation coating
2003.12.09	Decision on panel technology evaluation for enclosures composing electricity/distribution
2004.02.06	Decision on the technical evaluation of the assembly structure of the enclosure constituting the electricity/distribution
2004.07.21	Registered a patent for the panel for the enclosure constituting the switchboard/distribution board
2005.06.23	Recognition Ceremony for Excellent Product Selection by Public Procurement Service (Selected as a representative Company)
2005.08.17	Performance certification by the Small and Medium Business Administration (No. 13-002)
2006.01.01	New product certification by the Ministry of Commerce, Industry and Energy (NEP-2004-051(EM))
2006.10.01	Selected as a support company for new product development project under purchase condition by the Korea Rail Network Authority
2006.12.20	Our electrical panel got the performance certification by the Small and Medium Business Administration
2007.05.30	Recognized as a R&D department
2007.06.14	Confirmed as a venture company by Korea Technology Finance Corporation
2008.01.16	Designated as a priority purchase item by Korea Electric Power Corporation
2008.04.01	Registered as a new and renewable energy company
2008.04.11	Completion of industrial evaluation for railroad junction box under purchase condition
2008.05.29	Acquired ISO 9001
2008.09.18	Extension of performance certification for insulation and sound absorption enclosures for outdoor electric and electronic controllers
2009.08.26	Registered patent for electricity/distribution board cubicle and transformer enclosure
2009.12.31	Registered 2 patents for electrical panel
2010.06.14	Designated as No. 78 of Power New Technology (NET) by the Ministry of Knowledge Economy
2010.07.28	Registered 4 performance certifications by the Small and Medium Business Administration (electrical panel, automatic control panel, electric base, distribution panel)
2010.10.28	Designated as an excellent product by the Public Procurement Service (electrical panel using natural convection heat circulation technology)
2010.12.03	Signed the K-water new technology (batch) use agreement
2011.07.01	Cooperation with the Ministry of Defense to spread new technology and excellent products
2011.07.21	Model Small and Medium Business Award by the Small and Medium Business Administration (patent sector)
2011.08.11	Performance certification by the Small and Medium Business Administration (solar power inverter board using natural convection heat circulation technology)
2012.11.02	Registered the distribution panel patent
2013.01.10	Designated as a technology innovation small business (INNO-BIZ) certificate
2013.01.30	Registered the patent for distribution board and electrical panel
2013.02.21	Green technology certification (natural convection heat circulation technology of electrical panel using discharge side) (No. GT-13-00024)
2013.03.14	Confirmed by Green technology product (electrical panel using natural convection heat circulation technology on the discharge side) (No. GTP-13-00008)
2013.11.21	Green specialized company certificate (No. GE-13-000043)
2014.05.27	Registered the patent for electrical panel (No. 10-1403013)
2015.02.13	Patent registration (seismic device for power distribution facilities)
2015.07.20	Approval of cooperation business plan between small and medium enterprises
2015.09.21	Passed the seismic performance verification of the seismic high-voltage panel (0.6G-0.9G, the highest in Korea (150%))
2015.09.24	Patent registration (street lamp head)
2016.01.15	Revision of group standard (high voltage switchboard [SPS-KIMC2101-069-4], low voltage switchboard [SPS-KEMC2101-0610-4])
2016.02.11	Certification of participation in the preferential purchase system for small business products
2016.02.25	Awarded a citation from the Small and Medium Business Administration (No. 13735)
2016.08.03	Performance certification (enclosure heat emission promotion device and switchboard with seismic function)
2017.09.25	Acquired the group standard certification
2017.12.28	Designated as an excellent product by the Public Procurement Service
2018.03.08	Green technology certification (new) No. GT-18-00408
2018.03.08	Green Technology Product Confirmation (New) No. GTP-18-00724
2018.10.01	Patent registration (explosion-proof type electrical panel)
2019.01.07	Patent registration (seismic device for distribution facilities)
2020.08.01	Performance Sharing System Contract with the Office of Waterworks in Daegu Metropolitan City
2020.09.08	New technology contest adoption and performance sharing system contract with the Korea Land and Housing Corporation
2020.12.02	Presidential Award for Electrical Safety Management (No. 226329)



Overview of development

Enclosures contain the basic technology behind the switchboard, but we are not aware of the importance of the technology.

Enclosure technology is more about the field of mechanical sheet metal than electricity, but just as case technology among mobile phone technologies influences the quality for operation and use of mobile phones, closed switchboards and distribution boards also give significant impact on the performance, efficiency, and safety of built-in devices depending on the technology of the enclosure. However, electricians do not pay much attention on this.

In particular, for the 4th convergence industry, the function, performance, efficiency, and lifespan etc. of the built-in devices determine winning or losing according to the enclosure technology.

With the development of panel enclosures using compression insulation, new products (NeP) and signal boxes of the National Railroad Authority were developed under the condition of purchase by the Ministry of Small and Medium Venture Businesses to register the standard of the signal box structured by insulation input of Korean national railroads. In addition, thermal circulation technology using exhaustion areas is designated as the new technology of electricity, as well as natural convection-type enclosures have been changed into the closed-type high-voltage of the Korea Electrical Industry Cooperative (SPS-KEMC), and enclosures of low-voltage switch board changed into natural convection type (Korean Standards Association on February 26, 2016), the breathing distribution panel was developed.

Our earthquake resistant technology is one step higher than Japan, which boasts the best in the field, and in 2015, the technology passed the seismic resistance 0.9g (earthquake 10-11 degrees) test of KOCED seismic resistance high voltage switch board to verify the seismic performance.

In order to prevent disasters for electricians, we have developed explosion-proof protective devices to prevent the explosion pressure caused by accidents in internal devices of the switchboard and damage to people and property.

We look forward to an opportunity to advance enclosure technology that has not been of interest to electrical engineers.

Row switchboard, insulation/switchboard, insulation/low voltage switchboard, sound-absorbing box, pad S/W, street light control box



Row switchboard



insulation
/switchboard



insulation/low
voltage switchboard



sound-absorbing
box



pad S/W



street light
control box

The company of accumulation, Ilshin Electric Co., Ltd. returns with quality.



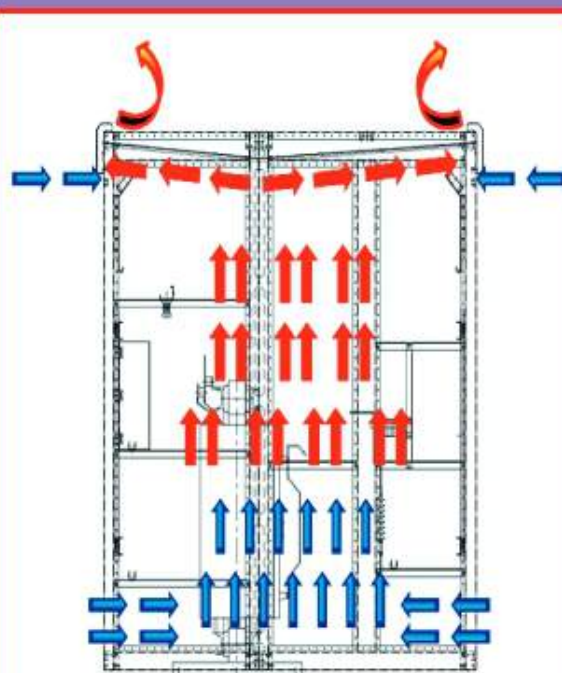
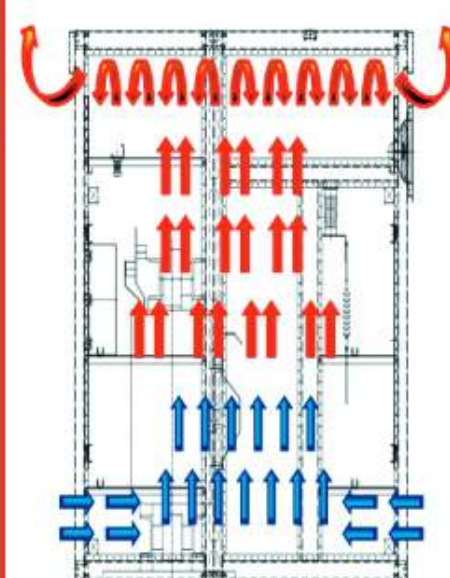
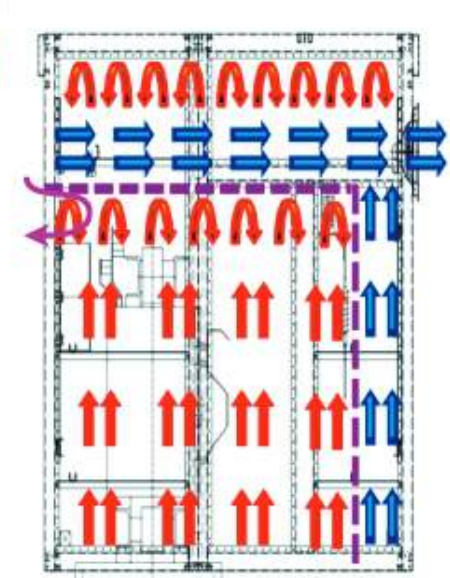
Why is the temperature inside the enclosure important?

- Panel born with another new technology on top of the existing technology
(Green Technology (No. GT-13_00024), New Electric Power Technology No. 78)

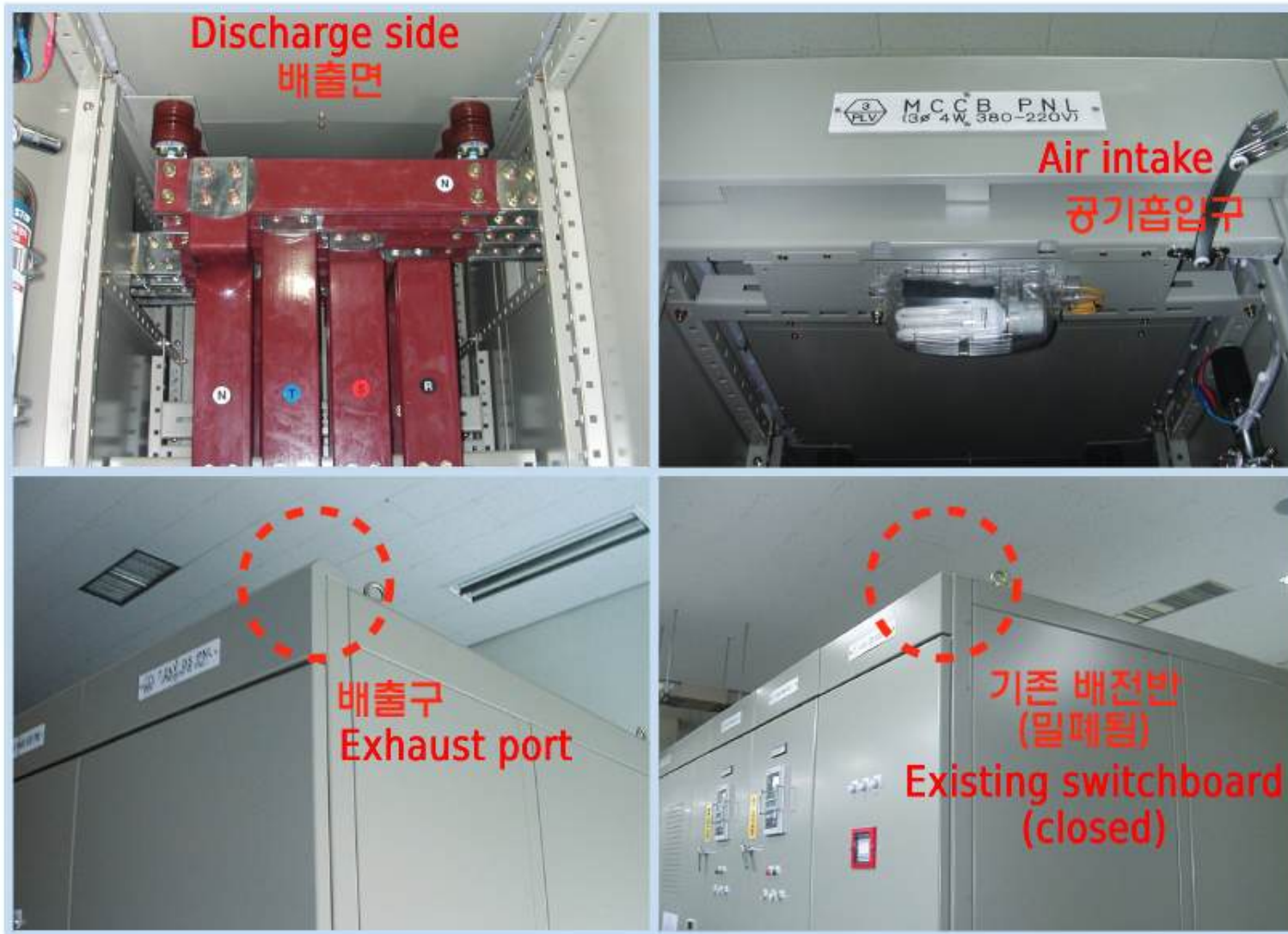
The natural convection switchboard discharges the heat generated by internal devices to the outside by doubling the flow of the elevated heat using the discharge surface.

By increasing the distance between the discharge surface at the bottom of the ceiling and the discharge port at the top and the air intake port at the bottom as much as possible, the thermal buoyancy due to the difference between wind pressure and temperature increases, so it is a technology to discharge the internal heat inside the enclosure and lower the internal temperature. Accordingly, it is a green switchboard that improves the efficiency of the device built into the switchboard by preventing the shortening of the lifespan of the device, deterioration in performance, and reduction in efficiency due to high heat in the enclosure.

In particular, in the case of outdoors, the double structure of the internal inflow of direct sunlight and conductive heat and the discharge of the ceiling fundamentally prevents the temperature down and condensation in the enclosure by using insulation materials, and the insulation material maximizes the sound-absorbing effect to block noise by punching the inner plate for signal sounds and noises. Also, it is an eco-friendly switchboard that prevents energy loss and accidents by cutting off external heat and maximizing heat circulation.

Class-ification	Natural convection type	General product	
		Normal times	When ventilation fan is operated
Heat flow chart			 <div>Air cutting phenomenon</div>
Cooling way	<p>The air circulation between the inside and the outside uses a ventilation port to increase the height of the air inlet and the outlet, and the rising air flow of the air is doubled by using the angle of the discharge surface under the ceiling and smooth natural ventilation to double the rising air flow of the heat and keep the temperature inside the switchboard at the lowest possible.</p>	<ul style="list-style-type: none">■ There is no special method for increasing the internal temperature in almost cases, and the internal air is forcibly circulated using a fan.■ When relying on the Cooling FAN, the cooling effect drops due to the limit temperature of the cooler when the temperature exceeds a certain level.■ Cooling facilities for the entire electric room to prevent the internal temperature rise of the closed switchboard	
Additive effect	<ul style="list-style-type: none">■ Natural double roof is formed, external • internal temperature is blocked, external • internal condensation does not occur fundamentally■ Temperature drop improves the safety, utilization and efficiency of the transformer, and saves electricity.	<ul style="list-style-type: none">■ Temperature increase causes device stability and efficiency to decrease, leading to excessive power consumption■ When the internal heat circulation is stagnant, excessive power costs are required due to condensation occurring under the ceiling of the switchboard.■ Air cutting phenomenon occurs when the ventilation fan is operated (equipment temperature stagnation phenomenon)	
Economy	<ul style="list-style-type: none">■ Transformer life is increased 5 times, manufacturing cost is saved by 12% (assuming 10°C drop)■ About 4% of energy saving, transformer utilization rate increased by 12%■ 12% reduction in carbon dioxide emissions (green technology certification, green technology products)■ No need for electric room cooling facilities and other ventilation facilities, so there is no consumption of electricity cost.■ 20°C difference in closed switchboard molded TR panel winding temperature of indoor installation under the same conditions (Shincheon sewage treatment plant)		

External/internal structure of natural convection type closed switchboard



Internal temperature rise test for heat dissipation technology inside the electrical panel

Korea Testing Certification Institute (KTC) → Test date: Jun.03, 2015 ~ Jun. 05, 2015 (3 days)

- Product name: Closed switchboard (TR panel)
- Size: 22.9KV 380V / 220V 3Ø 300Kva
- Model name: General closed switchboard, applied product (natural convection type)

Test item	Unit	General closed type	Applied product	Temperature difference
Maximum oil temperature rise		46.10	33.80	-12.30
Average winding temperature rise	HV. SIDE	51.96	37.55	-14.41
	LV.SIDE	53.40	39.40	-14.00

Remarks: 1. The temperature of the transformer is measured by changing the ceiling of the enclosed switchboard (TR panel).
 2. The general closed type is used by the ceiling used for the existing product, and the natural convection type used by the ceiling changed by the client.
 3. Temperature rise test follows the standard of KS C IEC 60076-2 (2013)





Energy saving comparison between green switchboard and general switchboard

■ Electrical panel

Classification		Electrical panel of natural convection heat circulation			General electrical panel		
Overview		Technology that discharges heat generated from indoor and outdoor internal devices to the outside using the natural air rising airflow			A fan or cooling facility is installed to discharge the stagnant heat from electric devices to the outside.		
E v a l u a t i o n i t e m	Classification	Upper	Middle	Lower	Upper	Middle	Lower
	Future-oriented	○				○	
	Maintainability	○				○	
	Quality Improvement						
	Energy performance	○				○	
	Economy	○					○
	Constructability		○			○	
	Durability	○				○	
	Aesthetics						
	Stability	○					○
	Variability						
	Convenience						
	Eco-Friendliness	○					○
	Controllability	○				○	
	And other performances						
* Please rate the applicable items. (More than 6 items)							
Review opinions		<ul style="list-style-type: none"> • Electrical panel that lowers the transformer winding temperature by more than 10°C compared to the existing electrical panel without a cooling facility. • Energy saving: about 4% reduction • 5 times longer for the life of the transformer • 12% reduction in production cos • 12% increase in transformer utilization • 12% reduction in carbon dioxide emissions 					
Initial investment (including expenses)		Plan 1			Plan 2		
		KRW 103,000,000 (based on mold transformer 2,000kVA) * Increased efficiency by saving 250kVA High pressure 4 sides, TR 3 sides, low pressure 3 sides TR 750x2, TR 500x1			KRW 107,000,000 (based on mold transformer 2,250kVA) High pressure 4 sides, TR 3 sides, low pressure 3 sides TR 750x3 60W x 10 units x 4 hours x 100 days = 240kwh		
Annual maintenance cost		Annual savings KRW 8,661,720			30W x 10 units x 4 hours x 100 days = 120kwh KRW 200,000 (electricity charge and replacement cost for the fan)		
Annual energy cost		KRW 83,730,240			KRW 93,642,750		
Transformer type		Capacity (kVA)	Number of units	Iron loss (W)	Copper loss (W)	Loss (W)	Total loss (W)
Mold transformer		3 φ 750	1	2,100	9,050	11,150	
Mold transformer		3 φ 500	1	1,500	6,400	7,900	

[참조 LS 2011. 04]

Group standard

Group standard is established only when there is no Korean Industrial Standard (KS).
Technical standard aimed at improving industrial competitiveness through product quality enhancement, production efficiency improvement, technology innovation, simple process and consumption rationalization

Article 27 of the Industrial Standardization Act (Establishment of collective standards)

[Basic applied standard of switchboard and distribution panelboard]

- Korean Industrial Standard (KS) (electric motor product)
- Group Standards (SPS) (wire equipment products)
- Korea Electrical Manufacturers Cooperatives (SPS-KEMC) (manufacturing switchboards and distribution panel boards)
- Standard Specification of Korea Electric Power Corporation (ES) (KEPCO switch board)
- International Electrical and Electronic Standards Association (IEC) (design, development, safety and environmental standards)
- Korean Electrical Equipment Regulations

Future Value, Ask KSA
KSA 한국표준협회 Korea Standards Association Future Value, Ask KSA
한국표준협회

수신자 : 전기공업협동조합 이사장 (표준담당 부서장)
(경유)

제 목 : 전기분야 단체표준 전문위원회 개최결과 안내

1. 귀 단체의 무궁한 발전을 기원합니다.

2. 귀 단체에서 등록신청한 단체표준안을 '단체표준지침및촉진운영요령' 제10조 외 규정에 의거하여 다음과 같이 심의하였음을 알려드립니다.

- 다 음 -

일 시	2016년 2 월 26 일 (금) 14:00 ~ 16:00		
장 소	한국표준협회 역삼본부 20층 제2회의실 (서울 강남구 역삼동 701-7 한국기술센터 20층, 2호선 선릉역 5번출구)		
안 건	제정	-	개정 2 확인 -

단체명	표준번호 표 준 명	심의결과	위원회 주요의견
한국전기공업협동조합 (개정 2중)	SPS-KEMC 2101-0609-4 고압배전반	동결	- 개정 부속서, 특허권 등록 표기가 적절하게 반영됨
	SPS-KEMC 2102-0610-4 저압배전반		

붙.

한국표준협회장



수석연구원 센터장

서명 2016-표준정책연구센터-0064 (기안 : 2016.03.08 / 완료 : 2016.03.08)
주 135-040 서울 강남구 테헤란로 305, 한국기술센터 20층(역삼동) / <http://ksa.or.kr>
전화 02-6009-4850 / 전후 02-6919-4012 / 담당 : 최동근 (dgcchoi@ksa.or.kr) / 공개

KESSCO

"전기안전, 선도기업, 협력한 고객, 선한 미래"
Korea Electrical Safety Corporation
한국전기안전공사

수신 수신자장조

(경유)

제목 고압배전반 및 저압배전반 단체표준 개정내용 알림

정격전압 1kV 초과 52kV 이하에 적용되는 고압배전반과 정격전압 1kV 이하(적용 정격전압은 1.5kV 이하)에 적용되는 저압배전반의 단체표준(한국전기공업협동조합) 개정내용을 아래와 같이 알려니, 업무에 참고하시기 바랍니다.

- 이 래 -

1. 적용표준 : 권령표준 "붙임" 참조
가. 고압배전반 SPS KEMC 2101-609(개정 2016.03.08.)
나. 저압배전반 SPS KEMC 2102-610(개정 2016.03.08.)

2. 개정사유

자연대류 현상을 이용할 수 있도록 외함의 전장면 형상을 변경하여 배전반 내부의 온도상승을 저감시킴으로써 배전반 내부에 설치된 기기의 효율을 높이고 수명을 연장시킬 수 있는 구조기술(특허권 등록)을 단체표준에 반영하여 관련업체가 활용할 수 있도록 하기 위함

3. 개정내용

- 가. 배전반 외함 형상을 일반형과 자연대류형으로 구분하여 단체표준 부속서에 외함 전장면의 형상 예시(참고) 추가
- 나. 일반형은 외함 내부의 전장면이 평면상태의 구조를 가진 형상
- 다. 자연대류형은 외함 내부의 전장면 형상을 돌출시키고 돌출된 중앙에서 측면에 이르는 테이퍼형상의 구조를 가진 형상

4. 특허권의 사용

가. 단체표준개정에 반영된 특허권에 대해서는 특허권자가 누구든지 특허권을 무료로 사용하게 하였음

나. 특허 제10-0917379호(출원번호 제2008-0132006호)

- 1) 발명의 명칭 : 수배전반용 77비코 및 변압기 합체
- 2) 특허권자 : (주)왕선전기

붙임 1. 고압배전반 SPS KEMC 2101-609(개정 2016.03.08.)

2. 저압배전반 SPS KEMC 2102-610(개정 2016.03.08.). 끝.

Necessity for thermal circulation

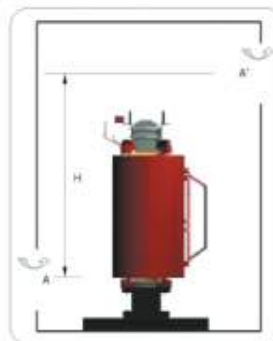


◀ Stagnant heat flow on upper parts

▼ Internal overheating fan is installed



Ventilation related ones when installing transformers



The transformer should be operated in accordance with the specified operating conditions, installation method and separation distance so that the life span can increase and stable operation of the transformer can be done.

Considerations for ventilation

Decision for the vent height and ventilation area [Refer to the figure]

- In the case of natural cooling, ventilation of the panel must be made to sufficiently dissipate heat generated by the total loss of the transformer through natural convection.
- Proper ventilation is achieved by inflow of fresh air from the inlet in the lower area A and outflow of air into the outlet A' located at height H above.



Ventilation calculation formula

$$A = \frac{0.18P}{\sqrt{H}} \quad A' = 1.10 \times A$$

- P(kW) = No-load loss + Load loss (At 120°C)
- A (m²) = Inlet area (mesh factor considered)
- A'(m²) = Outlet area (mesh factor considered)
- H (m) = height difference between inlet and outlet

※ The above equation is the most accurate when the average ambient temperature is 20°C.

Forced ventilation

- When the average ambient temperature is over 20°C or when operating under frequent overload conditions, forced ventilation using a fan is required if the vent area is below the standard.

Recommended flow rate (m²/sec) = 0.1 x total transformer loss (kW)

Seismic design is mandatory

According to the rules on the structure of buildings, etc. and the standard of the building structure, etc. in [Electrical Equipment Technical Standards in accordance with the Electricity Business Act, 5th clause of Article 21, 6th clause of Article 44], "the seismic resistance standard of the electric communication equipment in accordance with the Framework Act on Telecommunications" is set for transformer system, distribution facilities, and etc. Seismic design standards for buildings KDS 41 17 00: 2019

Seismic design and construction guidelines for the anchorage of electrical facilities in buildings, Korea Electrotechnical Commission
Mandatory by KECG 9701-2019, etc.

- In the case of natural disasters such as earthquakes, the substation facility suffers significant economic losses due to accidents such as structure collapse.
- Even when the intensity of the wave is below a certain level, earthquakes damage or malfunction internal distribution facilities or devices due to the conduction or collision by vibrations of the ground and structures.
- It is necessary to strengthen the seismic design to secure the safety for important structures and infrastructure facilities.
- Switchboards or distribution boards have a housing structure that is vulnerable to external seismic vibration, and are composed of electronic units such as power devices, control devices, switches, etc. This makes them vulnerable to earthquake shocks, so seismic design needs to be strengthened.
- According to the Meteorological Administration, the frequency of earthquakes of magnitude 5.0 or higher in Korea is also increasing recently, and it has been confirmed in past records as well.



No.	규모 (M)	발생연월일	진원시	진앙(Epicenter)		
				위도(°N)	경도(°E)	발생지역
1	5.8	2016. 9. 12.	20:32:54	35.77	129.18	8km south-southwest of Gyeongju-si, Gyeongbuk
2	5.3	1980. 1. 8.	08:44:13	40.2	125.0	Uiju-Sakju-Gwiseong regions of West Pyeongbuk [the region of 20km south-southwest of Sakju, Pyeonganbuk-do Province, North Korea]
3	5.2	2004. 5. 29.	18:14:24	36.8	130.2	Sea area of 74km east-southeast of Ulsin-gun, Gyeongbuk
3	5.2	1978. 9. 16.	02:07:05	36.6	127.9	Areas near Songnisan, Chungbuk (Area of 32km northwest of Sangju-si, Gyeongbuk)
5	5.1	2016. 9. 12.	19:44:32	35.76	129.19	9km south-southwest of Gyeongju-si, Gyeongbuk
5	5.1	2014. 4. 1.	04:48:35	36.95	124.50	Sea area of 100km west-northwest of Seogyeokalbido, Taean-gun, Chungnam
7	5.0	2016. 7. 5.	20:33:03	35.51	129.99	sea area of 52km east of Dong-gu, Ulsan
7	5.0	2003. 3. 30.	20:10:52	37.8	123.7	Sea area of 88km west-southwest of Baengnyeongdo Island, Incheon
7	5.0	1978. 10. 7.	18:19:52	36.6	126.7	Area of 3km east of Hongseong-gun, Chungnam
10	4.9	2013. 5. 18.	07:02:24	37.68	124.63	Sea area of 31km south of Baengnyeongdo Island,
10	4.9	2013. 4. 21.	08:21:27	35.16	124.56	Sea area of 101km northwest of Heuksan-myeon, Sinan-gun, Jeollanam-do
10	4.9	2003. 3. 23.	05:38:41	35.0	124.6	Sea area of 88km west-northwest of Heuksan-myeon, Sinan-gun, Jeollanam-do
10	4.9	1994. 7. 26.	02:41:46	34.9	124.1	Sea area of 128km west-northwest of Heuksan-myeon, Sinan-gun, Jeollanam-do

Seismic performance test



Status after the test of the equipment to be tested

시험성적서
CERTIFICATION OF TEST

성적서 번호 : 2015-R-107
(CERTIFICATION NO.)

경상남도 양산시 통곡읍 부산대학교 49 지진방재연구센터
SESTEC at Pusan National University, Mulgum, Yangsan, Gyeongsangnam, South Korea
Tel: 051-510-8180, Fax: 051-510-8181, Web: sestec@pnu.ac.kr

페이지(PAGE) : (1) / (20)



1. 의뢰자 (CLIENT)
기관명 (NAME) : (주)일신전기 IL SIN ELECTRIC MACHINERY CO., LTD
주소 (ADDRESS) : 대구광역시 북구 감당동로 21-길 42-38
42-16, Geomdangdong-ro 21-gil, Buk-gu, Daegu
2. 성적서용도 (USE OF CERTIFICATION) : 제품성능평가 Property performance evaluation
3. 시험명 (TEST SAMPLE NAME) : 고압변전장치 High pressure panel [seismic type]
4. 시험일자 (DATE OF TEST) : 2015. 08. 01
5. 시험방법 (TEST METHOD USED) : 의뢰인이 제시한 시험방법(방송통신설비의 내진시험방법 : 국립전파연구원공고 제 2015-14호)^{1,2}
방송통신설비의 내진시험방법을 준용하여 시험한 것으로 해당 시험방법을 적용하여 시험한 결과는
Test method suggested by the client (Seismic test method for
broadcasting and communication facilities: National Radio Research
Institute)
6. 시험환경 (TESTING ENVIRONMENT) : 온도 (26.8 ± 1.9) °C, 상대습도 (71 ± 5) %
7. 시험결과 (TEST RESULTS) : 첨부 자료 (Refer attached files)

이 성적서의 내용은 시험의뢰인에 의해 제공된 시료에 한하며, 용도이외의 사용을 금합니다.
(The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced except in full.)
이 성적서는 상품광고 및 기타 성격의 또는 소송 등의 목적으로 사용할 수 없으며, 사용 시 발생하는 법률상 문제에 대하여 발행기관이 책임을 지지 않습니다.

확인 (AFFIRMATION)	시험자 (TESTED BY)	승인자 (APPROVED BY)
직위 (TITLE) : 실무자 성명 (NAME) : 서영록	직위 (TITLE) : 기술책임자 성명 (NAME) : 정병규	

지원기관 (Sponsored by)



부산대학교 산학협력단 지진방재연구센터장
Seismic Simulation Test Center
of Institute for Research and Industry Cooperation at Pusan National University

2015년 12월 28일

시험결과
TEST RESULTS

성적서 번호 : 2015-R-107
(CERTIFICATION NO.)

시험명 : 고압변전장치 High pressure panel [seismic type]
(TEST SAMPLE NAME)

페이지(PAGE) : (2) / (20)



1. 시험대상설비의 규격 Specification of equipment to be tested

Table 1. 시험대상설비의 규격

Sample name (name of equipment to be tested)	Classification (check the test target)	Dimension (mm) ^{1,2}			Weight ^{3,4} (kg)	Serial Number
		Length	Width	Height		
고압변전장치	내진부 (연결부)	900	1,520	2,400	852	N/A
변전장치	면전장치 (비파괴)	150	150	90	N/A	N/A

Note 2) Refer to Appendix A and B for the detailed drawing and shape of the sample and the fixed state of the equipment under test. (5th Clause of Article 14 of Test method)

Note 3) The measured thickness is the weight of the sample excluding the jig for installing the shaking table.

Table 2. Parts list of equipment to be tested

구분	Product name	Serial number	Quantity	Manufacturer	Remark
1.	HVF	W08-06158	1	Hyundai Heavy Industries	
2.	JRG	N/A	1	IL SIN ELECTRIC MACHINERY	

2. 시험결과요약 Summary of the test result

Table 3. Summary of the seismic test result

Test items	TEST-01 (RRS 75%)	TEST-02 (RRS 100%)	TEST-03 (RRS 150%)
Checking the continuity of functions of the equipment under test before, during and after the test. Note 4)	No abnormality	No abnormality	No abnormality
One-way maximum displacement width at the top of the equipment under test (<75mm, based on 100% RRS)	6 mm	10 mm	18 mm
Amplitude or conduction of the equipment under test	No abnormality	No abnormality	No abnormality
Departure of the fixed part on the floor of the equipment under test	No abnormality	No abnormality	No abnormality
Departure of installed components	No abnormality	No abnormality	No abnormality
Deformation or damage to the frame of the equipment under test	No abnormality	No abnormality	No abnormality
The joint part of the raised floor structure itself is separated or the fixed part of the shaking table is separated	not applicable	not applicable	not applicable
Cracking, deformation and cutting of fixing devices such as anchoring, bolts, etc.	No abnormality	No abnormality	No abnormality
Other visible deformation or damage	No abnormality	No abnormality	No abnormality

Note 4) The seismic test method of broadcasting and communication facilities requires that the communication signal transmission status of the equipment under test should be checked before, after and during the test. However, on a regular test, check for continuity by measuring the electrical output signal of the equipment under test during the test. The entire part before and after the test was expanded to be checked.

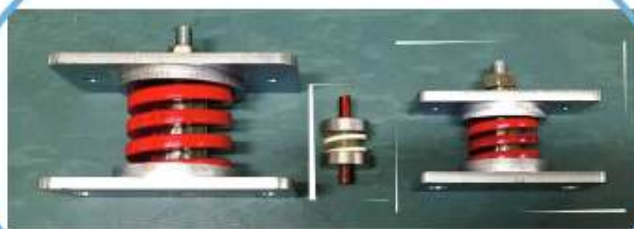
Note 5) The maximum displacement in one direction in the seismic test method of broadcasting and communication facilities is allowed or 75mm. In this test, the acceleration ratio of RRS of the test method was adjusted up to 75%, 100%, 150% and assumed each once, so the maximum displacement in one direction was recorded for each test.

(P-25-030)

Seismic high-pressure panel with natural convection heat circulation



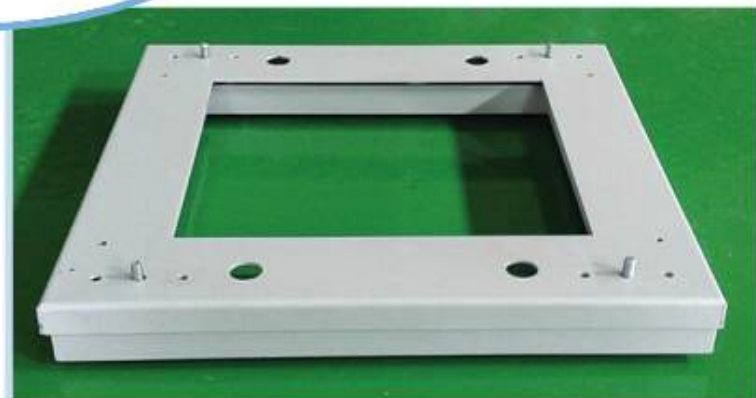
Seismic distribution board of Natural convection thermal circulation



Seismic devices



배전반 내진베이스



MCC반 내진베이스

■ Seismic structure with our technology

Our company manufactures products in a simple yet miniaturized way to install a derailment and a fixed distance device in the inner space of the main spring in order to prevent derailment and deformation at a certain distance, and it can reliably absorb the derailment and impact from the left and right in the inner space of the main spring. That is why it has the advantage of being able to perform its function well even under the high seismic shock.

- Seismic performance test, TEST-02(100%) 0.6G
- Seismic Performance Test, TEST-03 (150%) 0.9G (Announced as an excellent Technology Selection)

■ General seismic structure

In order to prevent derailment beyond a certain level on the outside of the compression main spring, which holds impacts, tension springs and other materials are used, and due to the parts installed to play various roles such as derailment and maintenance of a certain distance outside the main spring, it is weak against miniaturization and high seismic shock.

- Seismic performance test, TEST-02(100%) 0.6G

Natural convection type, seismic isolation system, explosion-proof switchboard

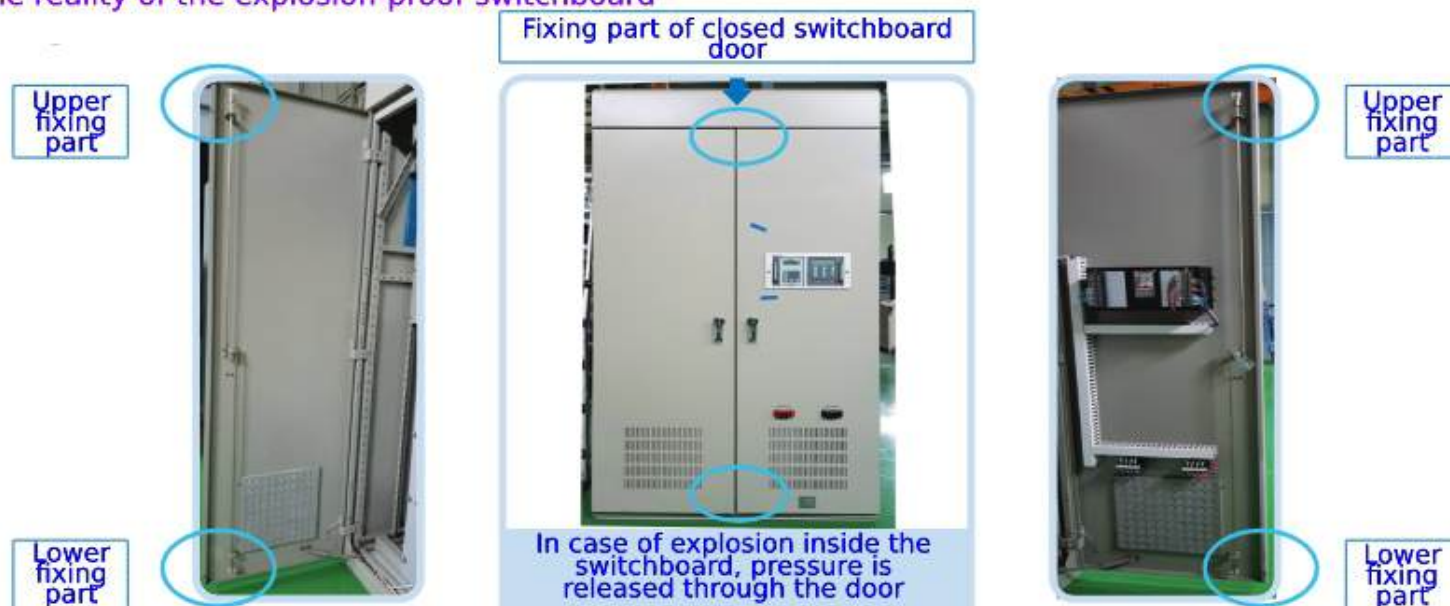
Advantages of natural convection type, seismic isolation system, and explosion-proof switchboard

1. Temperature decreases by dissolving internal heat stagnation using discharge surface
2. Prevent condensation by reducing the difference in internal and external temperatures by acting as a double roof with the ceiling discharge surface
3. Prevent from reducing device efficiency and service life due to lowering the temperature
4. Prevent from device failures and accidents due to temperature drop
5. Prevent from separation of switchboard and power equipment due to earthquake
6. Prevent from destruction insulation • short circuit and fire of electrical equipment with seismic isolation system
7. Safe evacuation of personnel and prevention from property damage by preventing power outages with a seismic isolation system
8. In case of explosion inside the switchboard, the pressure is released to the protective device to prevent personal injury



Explosion-proof switchboard

The reality of the explosion-proof switchboard



Necessity for an explosion-proof switchboard

- Protection Device based on Korea Electrical Equipment Regulation 351

Enactment and public notice for Korean equipment regulations in accordance with Article 4 of electrical equipment technology standards (announced by Ministry of Trade, Industry and Energy), No.43 of the same acts from Article 67 of electrical business laws of No. 2018-103 of the public notice from Ministry of Trade, Industry and Energy on March 9, 2018.

Appropriate protective devices or passages must be provided so that there is no danger to the person in charge of the Korean Electrical Equipment Regulation 351.7, and space required for operation of the equipment must be secured. (SPS-KEMC group standard has been applied in 2020)
In passive equipment of Ext. Regulation 3220-4, the minimum holding distance of the switchboard is specified.

[Minimum distance to be held for switchboards of passive equipment and etc.]

By part By device	Front side or operation /measurement side	Back side or inspection side	Thermal cross-talk (part to be checked)	Other side
Special high voltage switchboard	1.7	0.8	1.4	-
High voltage switchboard	1.5	0.6	1.2	-
Low voltage switchboard	1.5	0.6	1.2	-
Transformer, etc.	0.6	0.6	1.2	0.3

Note) It is specified that it is to maintain the space required for maintenance and inspection and the space effective for fire prevention.

- 1) Appropriate protective devices and passages shall be provided so as not to pose a danger to the handler.

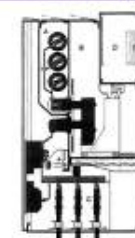
* Reasons for obligating protective devices

If there is no protective device when an accident occurs inside the switchboard, it is ejected through the door due to an internal explosion, and only securing a certain space cannot guarantee the safety of the handler. In particular, unlike the switchboards that prioritize the safety in advanced countries, our switchboards are defenseless for safety, and the door lock is also very weak.

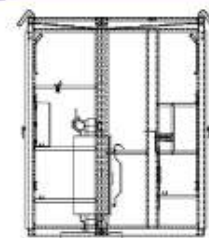
- 2) This developed protection device focuses on the production of the switchboard enclosure by using the structure of the existing switchboard in consideration of the characteristics of our switchboard and the weakness of the door lock.

- 3) We look forward to contributing to the safety of handlers and the power industry by making protective devices mandatory in the structure of our switchboard.

Examples of overseas technology

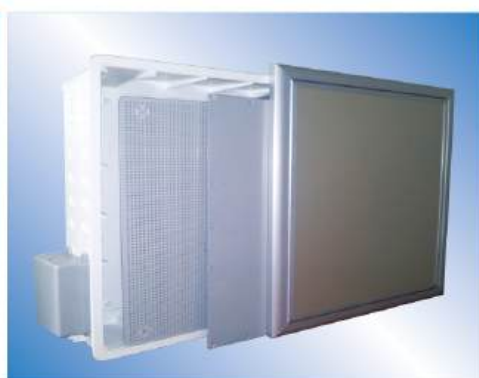


Examples of domestic technology (our technology) [Patent No. 10-1905844]



IL SIN

Frame type AL Door / Household terminal box / Household distribution board



■ Features of breathing distribution board door (advantages)

- Maximizes internal air discharge by maximizing the distance between the lower inlet and the upper outlet
- Air pollution is prevented by installing filters at the lower air inlet and upper air outlet.
- Green materials of Green Building Construction Support Act make it easy to grade green buildings.
- There is no risk of bumping the wall and the exposed part of the distribution panel due to curves, preventing safety accidents
- Aluminum is lighter than iron or stainless steel, so it is structurally safe
- Aluminum can be easily selected in size and color according to the needs of the consumer.
- Convenience of work and low price with extruded aluminum materials

■ Order specification

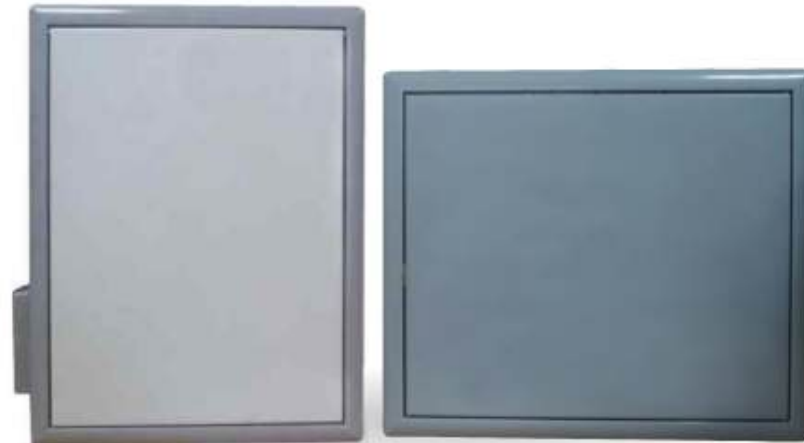
- Smart Distribution Board

Resources	Format	Size	Remarks
Aluminum (AL)	Frame type	400m/m × 300m/m	Door open left and right / Door open up and down
Plastic	Frame type	300m/m × 400m/m	Door open left and right / Door open up and down
Plastic	Natural convection embedded type	300m/m × 400m/m × 110m/m	Embedded box

※ AL Door 제작 크기는 수요자 요구
최대크기는 1200m/m × 1800m/m

Household terminal box

400(W) × 500(H) × 110(D) or 500(W) × 400(H) × 110(D)



• Vertical

• Horizontal



• Interior view

Classification	Content
VOICE	Multiplex or 24port
DATA	FDF 4Core(M/M:2, S/M:2) Light conversion device (FX:1, TX:16)
TV	MATV(6D), CATV(2D)
GATEWAY	Home Network Equipment

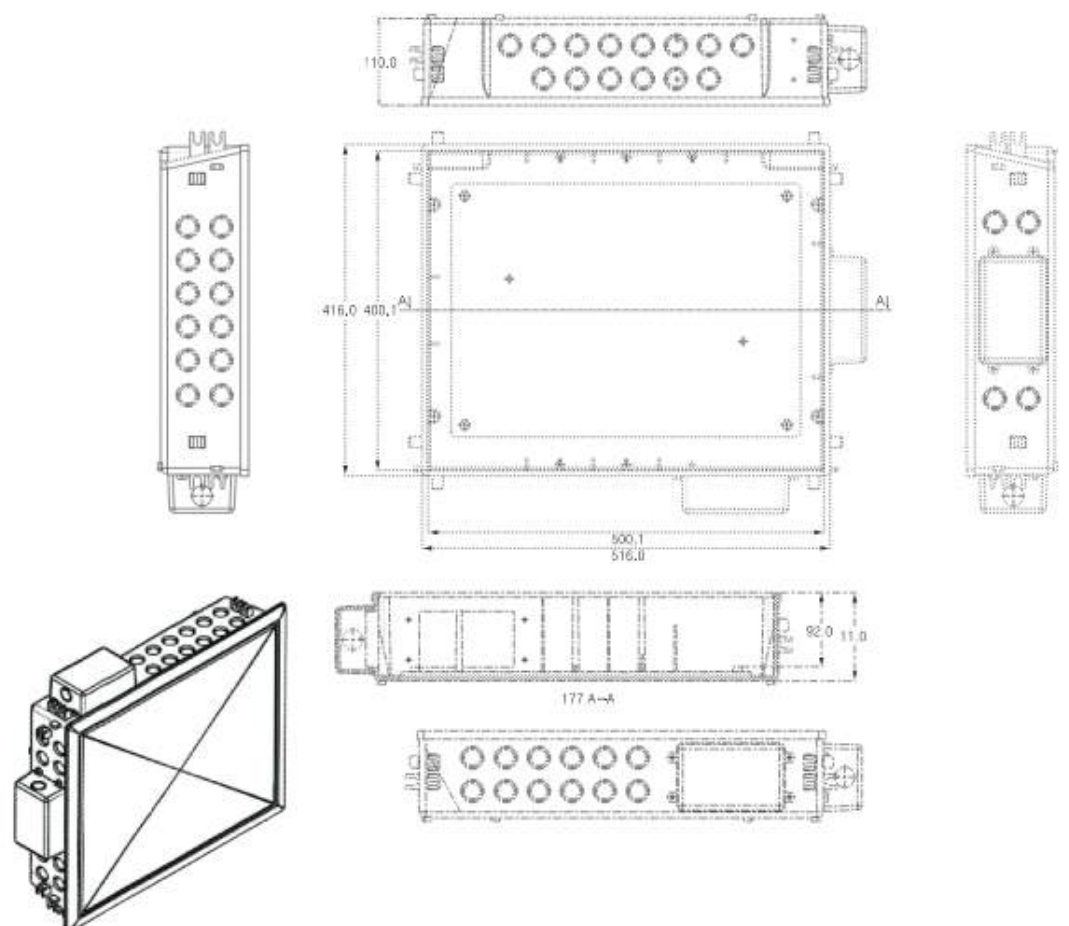
Order specification

- Household terminal box

Resources	Format	Size	Remarks
Aluminum(AL)	Frame type	500m/m × 400m/m	Door open left and right /Door open up and down
Plastic	Frame type	500m/m × 400m/m	Door
Plastic	Natural convection embedded type	500m/m × 400m/m × 110m/m 400m/m × 500m/m × 110m/m	Embedded box

Smart distribution board / Household terminal box

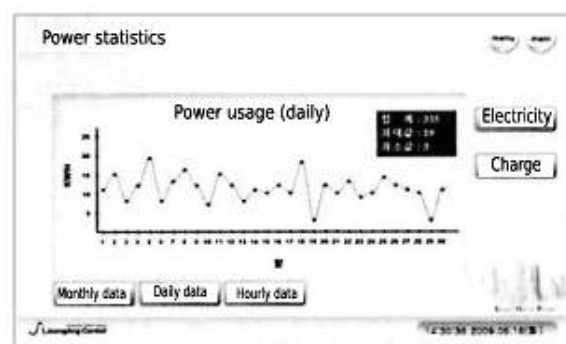
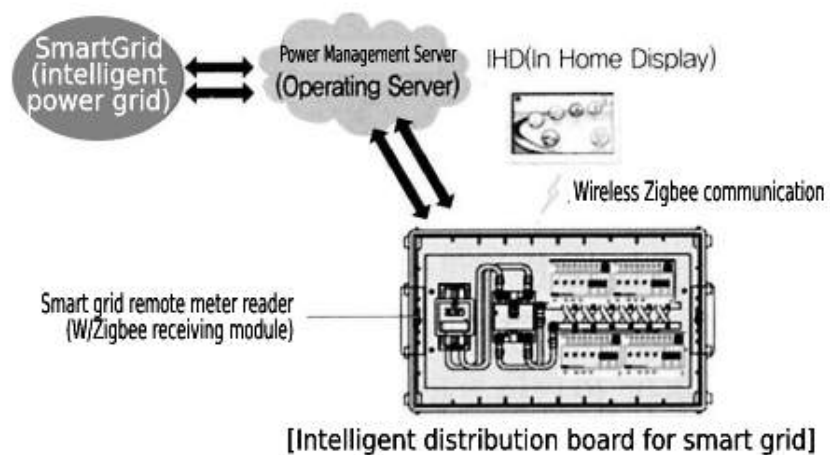
- 1) The breathing distribution panel has caused condensation inside the distribution panel due to the heat generated by electric devices or power elements and the cold temperature of the external concrete, causing many problems for safety of the device until now. The breathing distribution panel of this time goes with a technology that combines heat circulation technology. It is a distribution board that completely solved temperature rise of devices, contamination of vibration air, and condensation inside and outside.
- 2) Considering the environmental conditions when the enclosure of electrical and communication devices is embedded or exposed to the wall, there have been lots of limitations in terms of inside and etc. for the installation site, but the enclosure that this new technology of the discharge surface is applied is a product that is not limited to any adverse environment.



Household Distribution Board / Smart Distribution Board

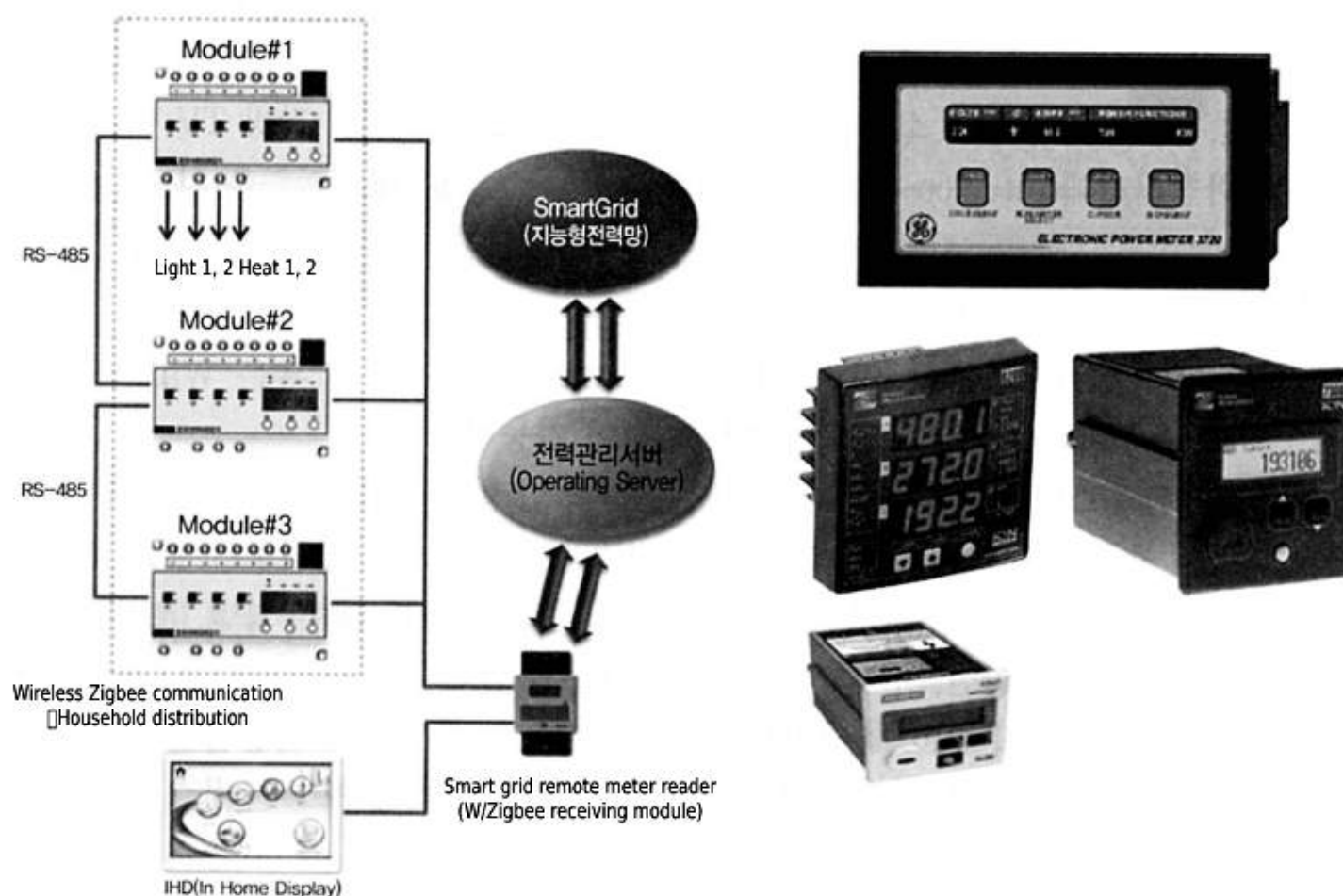


Currently installed household distribution board ►



[Power statistics graph]

AMM-000 [05/21]



<Configuration of smart household distribution board's built-in devices>

Constant switchboard fires, what is the reason and countermeasures

'Even if there are preventive technologies, they turn away because of the cost burden'

Introducing products with fire prevention function, regular inspection is the best

Electric fires status by ignition device (as of 2014)

Ignition equipment	Number of electric fires (cases)	Personal injury (persons)	Property damage (KRWx1000)
Electric equipmen	803	20	3,556,484
Meters	124	—	130,313
High-voltage&extra-high voltage switch	10	3	9,814
High-voltage&extra-high voltage Circuit breaker	7	—	20,789
Uninterrupted power supply	4	—	47,355
Generator	1	—	2,302
Cabinet/distribution panel	363	14	1,733,400
Battery/capacitor	8	—	62,881
Battery charger	5	—	50,682
Transformer	46	—	217,520

Ignition equipment	Number of electric fires (cases)	Personal injury (persons)	Property damage (KRWx1000)
Auxiliary power supply	2	—	5,449
Inverter/converter	4	—	20,113
Automatic Regulating voltage device	2	—	40,006
Low voltage switch	2	—	4,245
Low voltage circuit breaker	47	1	79,467
Rectifier	2	1	9,911
Control panel	13	1	113,486
Control box	32	—	184,479
Condenser	25	—	85,524
Other Jelectrical equipment)	106	—	738,748

◀ **More switchboard fires than expected** = According to the statistical analysis of electrical disasters by Korea Electrical Safety Corporation, a total of 8287 electrical fires occurred in 2014. By ignition device, there were 803 cases of electric equipment, 1706 cases of wiring and wiring equipment, 695 cases of seasonal equipment, 183 cases of industrial equipment, 17 cases of commercial equipment, 224 cases of household equipment, 43 cases of office equipment, 344 cases of kitchen equipment, 113 cases of video & audio equipment, 10 cases of medical equipment, 50 cases of agricultural equipment, 559 cases of lighting and signboards, 2 cases of vehicle and ship parts, 171 cases of other, and etc. Among these, switchboards and distribution boards account for the highest proportion of electric fires in electric facilities (803 cases).

There were 363 fires in the switchboard and distribution board, accounting for 45% of electrical equipment accidents. Most of the causes of accidents include poor insulation, malfunction of protection devices, flood damage & overload of moisture, corrosion, etc.

The damage caused by this was the highest among electric facilities, with 14 injured and 1,733 million KRW in property damage.

In addition, out of a total of 569 electrical equipment electrocution accidents, 14 people were injured in switchboards and distribution boards of low-voltage facilities, accounting for 2.5% of the total.



Manufacturing electrical panels of / heat circulation with natural convection / heat insulation material
Green technology certification, green product verification



주식회사 일신전기

IL SIN ELECTRIC MACHINERY CO., LTD

41503, 42-18, Geomdangongdan-ro 21-gil, Buk-gu, Daegu (20-4, Sangyeok 2-dong)

TEL : (053) 382-2580 FAX : (053) 382-2589

Gyeongbuk Branch: 580-11, Hyoja-dong, Nam-gu,

TEL : 070-4201-2580

<http://www.ilsinltd.co.kr>

Production items (for indoor and outdoor use)

1. Electrical panel of natural convection heat circulation
2. automatic control panel of natural convection heat circulation
3. Motor control panel of natural convection heat circulation
5. Insulation material outdoor switchboard
6. Insulation Communication • Electric Control Box
7. Breathing household terminal box
8. Breathing household distribution board

Various sizes can be customized

1. 600mm × 600mm × 800mm
2. 600mm × 300mm × 1,000mm
3. 600mm × 600mm × 1,000mm
4. 600mm × 800mm × 1,200mm
5. 800mm × 800mm × 1,500mm
6. 800mm × 1,000mm × 2,300mm
7. 1,200mm × 1,500mm × 2,300mm
8. 2,000mm × 3,000mm × 2,800mm

Various sizes can be customized