

We provide a total solution for customers with
the versatile software package and hardware system



REALGAIN

Find your Limits & Go beyond



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*We will be reborn as a trustworthy
company for 10 years and 100 years.*

REALGAIN began by localizing Science & Engineering software at Seoul National University research center of control measurement in the 1990s. in 1999, the company was established as a corporate body. Since then, we have strived to localize systems and equipment in the area of measurement, control, and communication in the power plant using IT-based and control measurement technology.

REALGAIN was certified for its technical skills by Westinghouse Electric Company(WEC) of the US, which provided most of the I&C systems in the power plant. Currently, we have signed an MOU with WEC and are supplying localized products.

Even now REALGAIN is continuously contributing to the development of the eco-energy industry of Korea with research and development, and through various solution development, we are doing our best to be a company that thinks of best value and environment.

Company History

1990 - 2008

1990-1999

- Developed the first domestic, wide use package, CEMTool (developed by Seoul National University ERC)

1999

- Founded REALGAIN (Dongjak-Gu, Seoul)

2000

- Founded R&D Division
- Appointed R&D Division as a military service exemption laboratory

2001

- Developed a high speed design system for controller and signal conditioner (domestically developed Korea's first and the world's 3rd)
- InnoBiz Certification

2002

- Developed lighting remote control system and installed in Jeonlla province

2004

- Qualified supplier for control rod control system equipment repair company
- Approved safety impact rating (T)

2005

- Developed coil current monitoring sensor
- Agreed separation filter panel localization development

2006

- Developed products for KHNP, released CEMTool 6.0 International edition
- Signed MOU with WEC
- Agreed to localize Korean standard type light isolation card
- Developed air-operated valve (AOV) integrity diagnostic equipment

2007

- Localized power plants Opto-Isolator Card and Filter Panel
- Approved control rod control facility maintenance service T grade

2008

- Recognized as an excellent cooperating company by KHNP
- Performed maintenance service of control rod systems in all Korean standard type nuclear power plants
- ISO 9001 Certification
- Exported ACTM sensor to WEC
- Appointed separation filter panel and Opto-Isolator card as development

2009 - 2014

2009

- Certified by KHNP to provide SOV diagnostic equipment
- Maintained WEC type control rod position indication system
- Order for digital control rod position indication system development
- Upgraded quality grade as maintenance service and equipment repair company

2010

- Selected to research the development of iron ball gun equipment by KHNP
- Certified by KHNP as a P.CB slot diagnostic equipment development company

2011

- Certified as a Local developer of in-core neutron detector for heavy water reactors
- Selected as a provider of electronic card slot measuring equipment by KHNP
- Developed WEC type Rod Control Monitoring System
- Developed Trouble Shooting diagnostic equipment for CEDMCS

2012

- Performed maintenance service of the rod control system in Shinkori 1 and Shinwolsong 1 power plant
- Developed diagnostic equipment for NPP safety system
- Developed DRPI (Digital Rod Position Indication) System
- Moved headquarter to Gangnam-Gu, Seoul

2013

- Opened a branch in Gijang-Gun, Busan
- Performed maintenance service of the rod control system, plant control system
- Develop, manufacture and deliver various facilities and equipment

2014

- Registered as a qualified maintenance company for 5 thermal power plants
 - DCS (Digital Control System) cards
 - Switchboard, automatic control supervisory panel and electrical control panel
- Developed an in-core neutron amplifier module
- Localized digital control rod position indication (DRPI) system

2015 - 2020



2015

- Supplied RCS Driving Coil Diagnostic equipment and 5 other items(Shinkori and UAE)
- Moved headquarter to Seongdong-Gu, Seoul

2016

- Supplied DPPS response time measurement equipment and 1 other item(UAE)
- Developed Sampler Electronics Ass'y for boric acid concentration meter

2017

- Supplied DRPI System(HANBIT) and customized PINPOINT Hardware & Software
- Performed maintenance service(rod control system, PCS, computer station for shutting down the reactor)
- Performed development task of SOV real-time monitoring system
- Performed development task of Integrated Diagnosis System for Power Plant Rotating Device Monitoring Sensor
- Maintained service of computer station for stopping reactor

2018

- Performed localization of ARP1400 electronic module CIM
- Developed and maintained an improved verification algorithm for the power plant control system of Hanbit unit 5,6 system
- Performed localization of the local control panel alarm system for the emergency diesel generator
- Performed localization of earthquake instrument calibration management system

2019

- Award of Capital Goods Industry Development Contribution
- Development of SOV Real-Time Monitoring System

2020

- Registration as the qualified supplier for B.O.P (J202) and maintenance service of radiation monitoring system
- Registration as the qualified supplier for Closed Circuit Television System (J205) for KHNP in South Korea
- Localization of optical coupler for Engineered Safety Features Actuation System (ESFAS)
- Localization of management system for earthquake instrument calibration
- Opening An-yang branch
- UAE BARAKAH NPP Unit 1~4 RMS (J202) & CCTV (J205) all equipments supply

2021 - 2022



2021

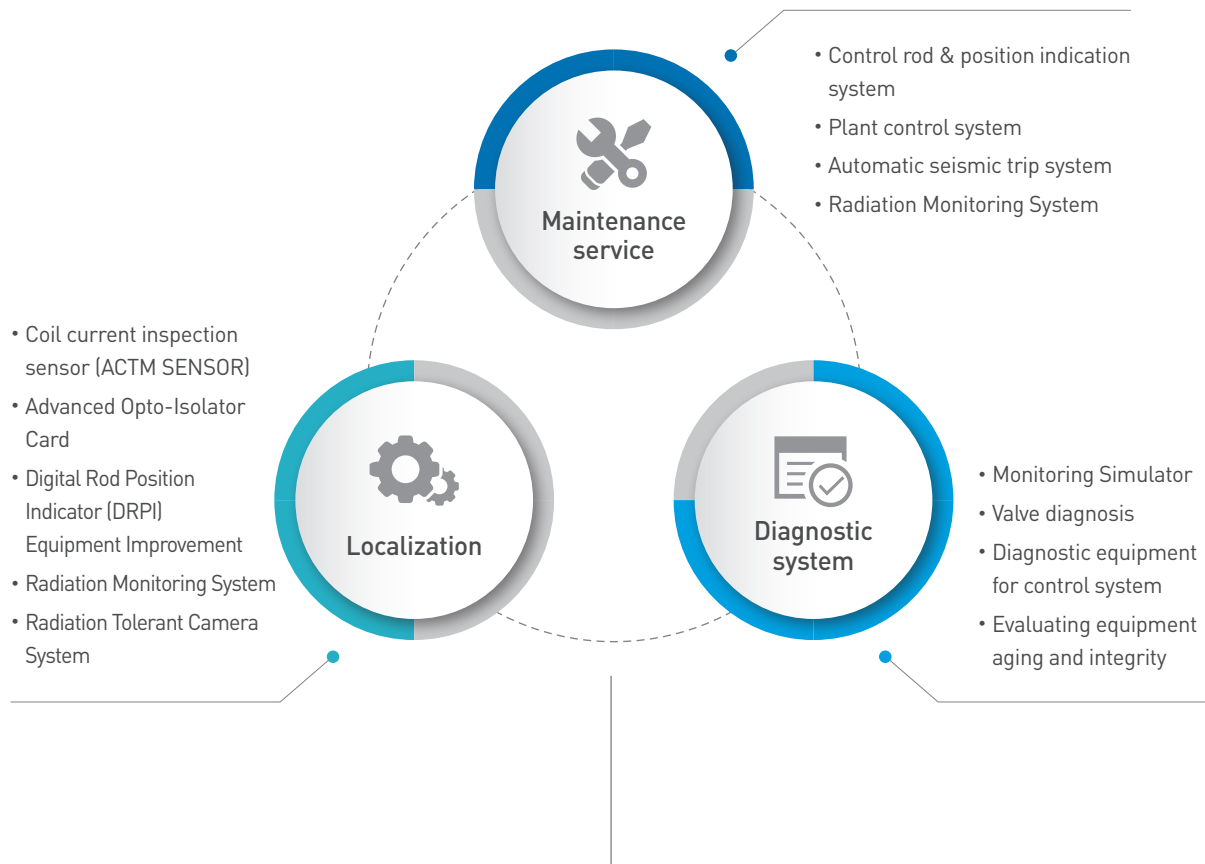
- Registration as a qualified supplier for CNCAN in Roumania
- Registration as a qualified supplier for NAWAH in UAE
- Localization of the alarm system of the local control panel for the emergency diesel generator
- Supply of "Q" class LCU (Local Control Unit) for radiation monitoring equipment in HANBIT NPP Unit 1&2
- HANBIT NPP Unit 1~6 maintenance service for radiation monitoring system
- Supply of "Q" class LCU (Local Control Unit) for radiation monitoring equipment in KORI NPP Unit 3&4
- Certification of Quality Management Systems (ISO 9001:2015)
- Opening Yeong-gwang office

2022

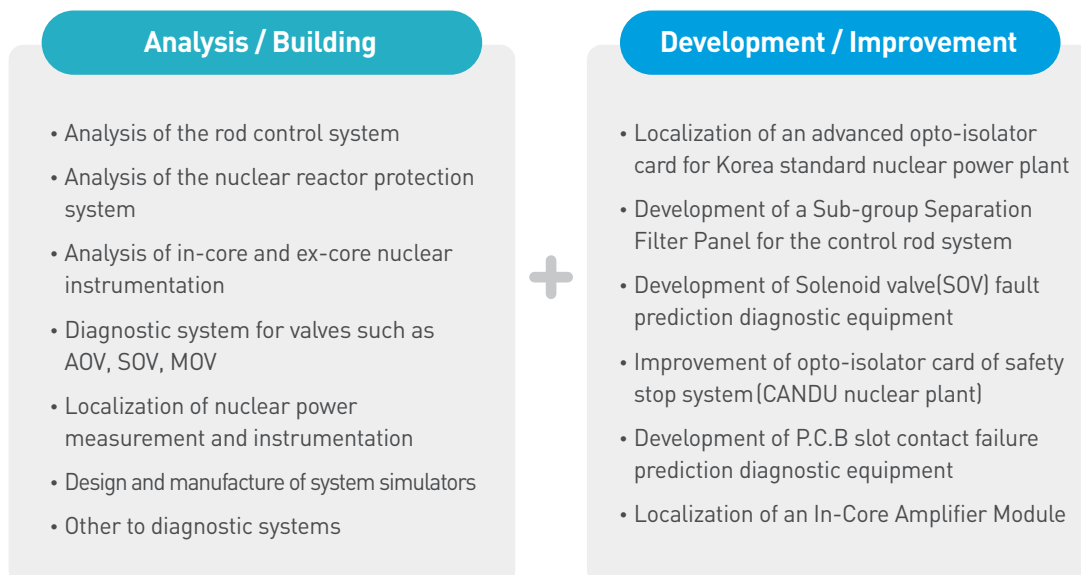
- Development of localization of signal processing module monitoring system of Ex-core Neutron Flux
- Development of monitoring and diagnosis technology of heavy water reactor fuel channel
- Development of the failure diagnosis system for equipment structures
- Registration as the qualified supplier for HVAC Control (J209) for KHNP in South Korea
- Certification of the quality assurance program for manufacture of class 1E monitoring system by KEPIC in South Korea
- Designation of Solenoid Valve (SOV) for Real-Time monitoring system as the innovation product
- Certification of Occupational Health and Safety Management System (ISO 45001:2018)
- Development of intelligent diagnosis system for nuclear reactor system
- Award as the best partner company of KHNP
- Designation of innovative products for integrated diagnostic system of monitoring sensors of rotating equipment
- Designation of promising company (G-PASS company) entering the overseas procurement market
- Designation of innovative products for radiation tolerant camera system
- Relocation of integrated office in Headquarter and An-yang branch

Business Scope

Development of facilities and equipment in the measurement, control and communication fields of power plants using I&C and IT-based technologies



Research area



Vision

A company that evolves based on new challenges
and technologies for the present and for the better future



Products

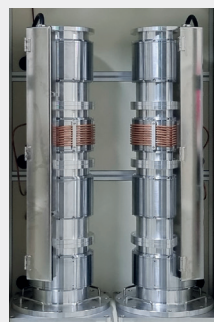
Monitoring and Diagnostic System



DPPS Digital Response Time Equipment



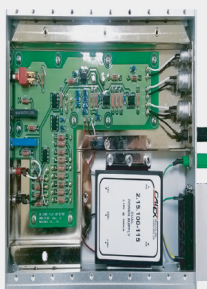
Diagnostic Equipment for the Control Rod Drive Coil



CEDMCS Simulator



DRPI Equipment Improvement



In-Core Amplifier Module



Coil Current Inspection Sensor(ACTM SENSOR)



NIMS(INSSS Integrity Monitoring System) Cabinet



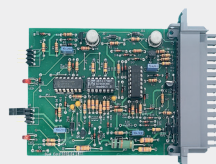
Advanced CIM (Component Interface Module)



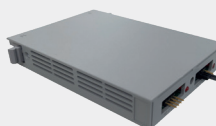
OPTO-COUPLER MODULE for ESFAS (Engineering Safety Features Actuation Signal)



AC 160 Hot Panel

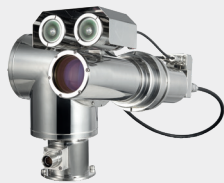


Emergency Diesel Generator (EDG) Alarm Card



Heavy Water Reactor Type(CANDU / 700MW)SDS#1 PDC-RELAY MODULE

Radiation Tolerant Camera System



KR17090ZWC

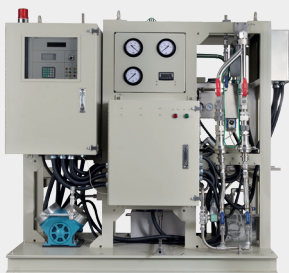


UWC-16100PTZLII HD



HPTC-120W

Radiation Monitoring System



Gas PERMS



Liquid PERMS



Area Monitor



RMS
Computer System



Safety Related
Divisionalized Cabinet

Boron Concentration Monitoring System and Power Supplies



BCMS-200



SY-PS-08-01



SY-PS-ESFAS



SY-PS-ILS-06,24,48



SY-PS-PPS

Digital Rod Position Indicator(DRPI) System

Introduction

After receiving the control rod position signal and processing the data, the control rod position and alarm state information are provided to the operator.

RG-3601

> Features

- Localization
- Improving reliability by configuring facilities based on VME system
- Increase efficiency of maintenance service by applying a commercialized hardware system with proven stability
- Utilizing highly reliable standardized communication method (RS-422)
- The system contains a redundant system. So if one becomes defective, there would still be a backup system capable of displaying control rod position information

> Under application

- HANBIT Power Plant (Unit 1-2)
- KORI Power Plant (Unit 3-4)

> Configuration

- Data cabinet
 - Power supply, Electronic card (Data I/O Card, D/E Card)
- Control cabinet
 - DC Power Box, Relay Box, Display PC
 - Control rod signal analysis software
 - Control rod position indication and monitoring software



Components

- ① Control Cabinet
- ② Data Cabinet
- ③ Power supply & Electronic Card

* DRPI : Digital Rod Position Indicator

Coil Current Inspection Sensor(ACTM SENSOR)

Introduction

Output a voltage proportional to the current applied to the rod coil using a Hall sensor and Hall Effect.

RG-ACTM

> Features

- WH Type
 - Cause numerous warnings and alarms due to errors in the input-output relationship
- REALGAIN
 - Site optimized design and precise tuning to improve output accuracy (Stabilize customer system operation) (Exported to Westinghouse, the original producer)

> Under application

- HANBIT Power Plant (Unit 3·4·5·6)
- KORI Power Plant (SHIN KORI Unit 1·2)
- HANUL Power Plant (Unit 3·4·5·6)
- WOLSONG Power Plant (SHIN WOLSONG Unit 1·2)



Components

- ① Cabel Ass'y
ACTM board connection / Test Point / Output calibration
- ② Sensor Ass'y
Ferrite core / PCB & Hall sensor

> ACTM Sensor's characteristics comparison

Model	1 WH	2 KHNP Type	3 NEW WH Type
Size	55 * 27 * 12 mm	55 * 26 * 11 mm	55 * 26 * 13 mm
Bolt end	One way	Both ways	Both ways
Connector	6 Pin plastic connector	4 Pin SN type	6 Pin plastic connector
Fix cable	Manual	Automatic	Automatic
Fix Ferrite	PCB type	Hinge	Hinge
Install cable	No need to reinstall	No need to reinstall	No need to reinstall
Organization convenience	Low	Low	Low
Hall IC	Output fixing	Output variable	Output variable
Output accuracy	Low accuracy	High accuracy	High accuracy
Development and production	Developed & produced by WESTINGHOUSE	Developed & produced by REALGAIN	Co-developed by WESTINGHOUSE and REALGAIN, produced and exported by REALGAIN

- ① WH Type Sensor is the sensor that causes warning that is installed in present power plant
- ② KHNP Type is the sensor being installed on KHNP as the product developed by REALGAIN Co., Ltd technology laboratory through KHNP task

- ③ New WH Type Sensor is the sensor developed based on compatibility with the present ACTM cable, instead of convenience of maintenance co-developed by WESTINGHOUSE and REALGAIN Co., Ltd.

In-Core Amplifier Module

Introduction

Amplifier module converts the current generated from In-Core Flux Detector to voltage and measures the amplified output voltage.

RG-4701

> Features

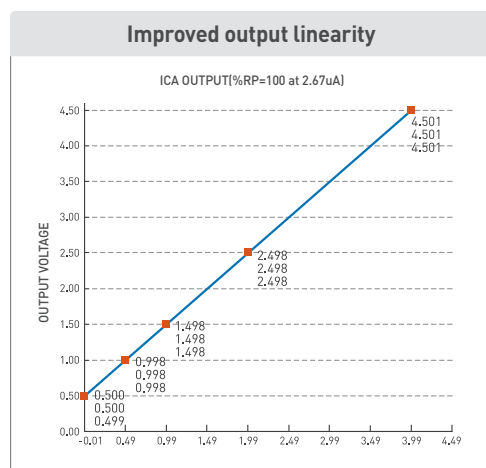
- Current
 - Output linearity is low and output response time differs from set point
- REALGAIN
 - Improved output linearity, accuracy and reliability of the amplification module. Improvement in response time and full compatibility with other modules

> Under application

- WOLSONG Unit 1·2·3·4

> Rating /Channel

- Number of Buffered Output : 2
- Output voltage range[0 ~ 150% R.P.] : 0.5 [V] ~ 4.5 [V]
- Output Impedance : $< 10\Omega$
- Response time : 10 ms(factory set)



* Certification

- Environment-resistance test : IEEE-323-2003
- Electromagnetic Test : Reg. Guide 1.180-2003
- Seismic test : IEEE-344-2004

* Specification

- Part Number : RG-4701
- Size : 8.72" × 1.35" × 9.80"
- Supplying Power : 120 VAC $\pm 10\%$ (60 Hz $\pm 2\%$)
- Detector input
 - Adjustment profit scope : 11
 - Current range(100% R.P.) : 440nA ~ 2.6 uA
- Others
 - Non-linearity(Percent) : $< 0.5\%$
 - Insulation(Dielectric)
- DC. leak current @500V : $\leq 1 \mu\text{A}$
- AC. leak current @500V, 60Hz : $\leq 1 \text{ mA}$

* ICA : In-Core Amplifier

Advanced CIM(Component Interface Module)

Introduction

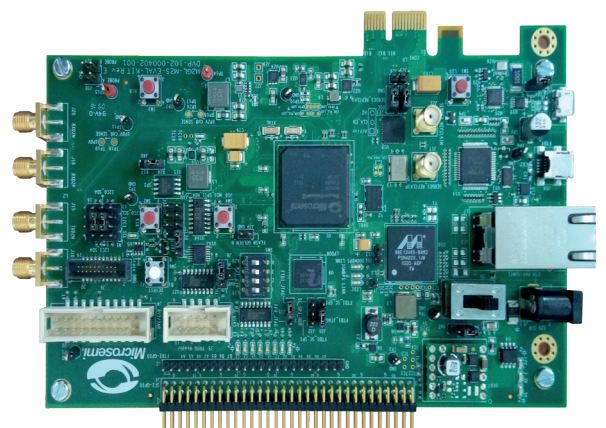
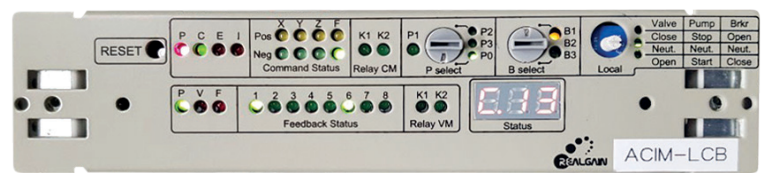
Process command signal of various systems according to priority. Generate drive signal and receive feedback signal for controlling field devices.

► Features

- Localization
 - By dividing the functions of existing WEC products into controlled groups, reducing the number of components to be used, simplifying UNIVERSAL COMPONENT LOGIC and improving reliability
- Major improvements
 - Improved surge protection circuit
 - Added inrush current limit function
 - Added external signal noise prevention circuit
 - Enhanced self-diagnosis function
 - Increased the convenience of jumper setting

► Configuration

- Feedback board
- Logic board



CEDMCS Simulator

Introduction

Consist of phase voltage converter for 240 / 139Vac three -phase 4-wire power supply, and a load tester that is a 4-axis control rod drive unit. Phase voltage converter converts 3-phase 480VAC to 240VAC and supplies it to the control rod control system. It is capable of implementing the same withdrawal and insertion as the field facility of standard type control rod control system.

KP-1301

► Features

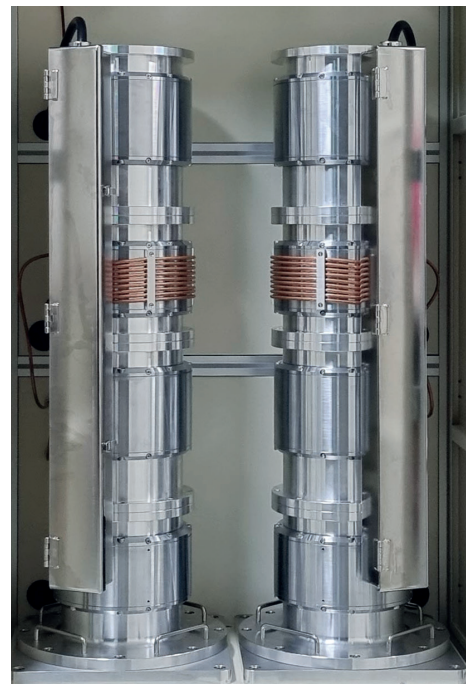
- Possible to operate the control rods by group and designed in order to easily grasp the reason for deviation between groups
- Possible to diagnose the breakdown of all cards
- Simulation function with arbitrary fault function mode
- Coil replacement / thermostat structure applied to detect aging and abnormal operation cause of control rod coil
- Unlike products from other vendors, our product can be driven without the load simulator connection
- Manual operation of the control rod using the joystick is possible, Graphic UI enables full signal flow identification
- Provides convenience of maintenance (easy hardware replacement structure and small / light weight)

► Under application

- HANBIT Power Plant (Unit 3·4·5·6)
- HANUL Power Plant (Unit 5·6)
- WOLSONG Power Plant (SHIN WOLSONG Unit 1·2)

► Components

- CEDMCS Simulator Module
- Control card fault diagnosis Function Module
- Phase voltage converter/PSA(power switch assembly)
- Logic Housing(Control rod drive logic card)
- Operator Module(Interfaces between operator and simulator)



Speed Sensor and Acceleration Sensor Diagnostic System

Introduction

- Speed/displacement sensor
 - After fixing the sensor, measure the output of the sensor while changing the rotational speed of the rotary gear
 - Measuring the output of the sensor according to the distance from the rotary gear while moving the position of the sensor
- Speed/acceleration sensor
 - After attaching the sensor to the diagnostic unit, measure the output of the sensor while changing the speed / acceleration.

RG-P00800

➤ Features

- Speed Pickup Sensor
 - Measure sensitivity by velocity
- Displacement Sensor
 - Measure sensitivity by distance
- Speed/acceleration Sensor
 - Measure sensitivity by frequency change

➤ Under application

- Ulsan Oil-Fired & C.C power complex
- Applicable to all Power Plant

➤ Rating/Number of Channel

- 1CH



Components

- ① Speed Pickup Sensor & displacement Sensor measuring part
- ② Speed & acceleration Sensor measuring part
- ③ Diagnostic Notebook

Control Element Drive Mechanism(CEDM) Coil Current Constant Monitoring System

Introduction

Analyze the waveforms of the current that flows through the control element by connecting coil current measuring equipment to the power cabinet.

RG-5001

➤ Features

- Localization
- Automatically analyzes the driving current in the control element accurately
- Isolation circuit design enables non-contact diagnostics
- Real time judgment without interference between power control box and drive coil connection facility (Enable remote waveform analysis using TCP / IP)

➤ Under application

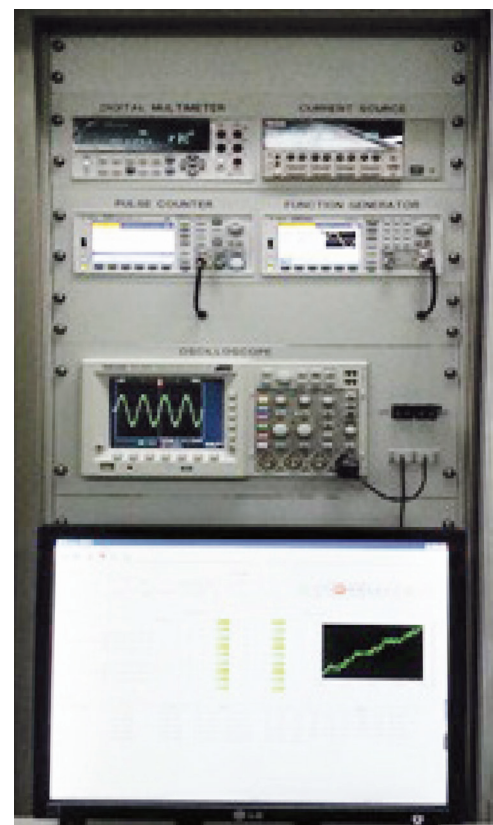
- HANUL Power Plant (Unit 1-2)
- KORI Power Plant (Unit 3-4)

➤ Rating/Number of Channel

- 16CH

➤ Configuration

- Hardware
 - Digital Signal Processing Module (Diagnostic Equipment Control Computer)
- Software
 - Standard CEDMCS Waveform Analysis Algorithm
 - Determination Algorithm



DPPS Digital Response Time Equipment

Introduction

Ensure that the operating time of the plant protection system (reactor protection system, engineering safety features operation system, diversity protection system) is measured and maintained within the operating time limit.

RG-3401

> Features

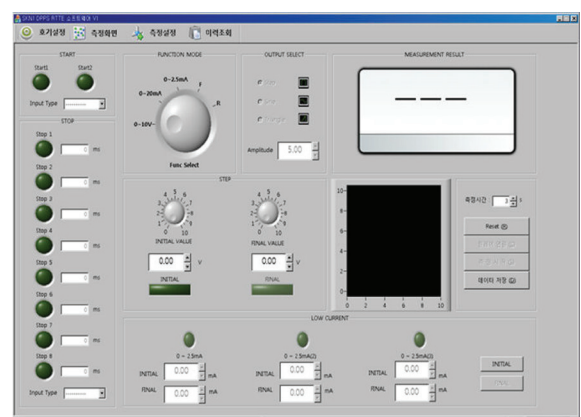
- Field transmitter response time measurement test
- DPPS response time measurement test
- DESFAS sub relay response time measurement test
- DPPS cabinet and RTSG response time measurement test
- CPC/CEAC response time measurement test
- RTD response time measurement test

> Under application

- KORI Power Plant (SHIN KORI Unit 1-2)
- UAE Barakah Power Plant (BNPP)
- HANUL Power Plant (SHIN HANUL Unit 1-2)
- WOLSONG Power Plant (SHIN WOLSONG Unit 1-2)

> Rating/Number of Channel

- Voltage Output : 2
- Current Output : 3
- Trans Output : 1
- Resistor Output : 1
- Signal Conditioning : 8



Components

- | | |
|-------------------------|------------------------------|
| ① Diagnostic Controller | ② Voltage Output Module |
| ③ Current Output Module | ④ Signal Conditioning Module |

* DPPS : Digital Plant Protection System

* PPS : Plant Protection System

* DESFAS : Digital Engineered Safety Features Actuation System

Diagnostic Equipment for the Control Rod Drive Coil

Introduction

Equipment that diagnoses the integrity of control rod drive coil in the control rod control system.

KP-0102

➤ Features

- Current
 - Measure manually the value of the DC-Resistance.
In the event of a fatal damage, a change in value causes inaccurate diagnosis of integrity
- REALGAIN
 - Diagnose the aging of coil before fatal damage, by measuring not only the DC-Resistance but also the AC-Resistance, inductance value and Q-factor. It eases the analysis and allows for the historical management of data

➤ Under application

- HANBIT Power Plant (Unit 1·2·3·4·5·6)
- HANUL Power Plant (Unit 1·2·3·4·5·6)
- WOLSONG Power Plant (SHIN WOLSONG Unit 1·2)
- KORI Power Plant (Unit 1·2·3·4 SHIN KORI Unit 1·2)

➤ Configuration

- Control rod driving coil diagnosis function
- LCR Meter for diagnosis
- Relay Module for diagnosis
- Software for analyzing coil variable temperature, zero point and data
- Computer for diagnosis
- History Management program



PIN POINT Electronic Card Diagnostic Equipment

Introduction

Analyze the input/output of the electronic card, check the output signal against the input signal, and check the integrity of the electronic card.

RG-P0002

► Features

- Diagnose the integrity of digital and analog electronic card (implementation of operation loop)
- Check the integrity of microprocessor, firmware, SW (FPGA, FID) Logic
- Main and additional function for individual electronic card can be tested separately
- Early detection of aging deterioration and changes in characteristics (preventive maintenance system), timely action
- Identify the cause quickly and accurately when a problem occurs
- Can be applied to all electronic cards through development of separate JIG

► Under application

- WOLSONG Power Plant (SHIN WOLSONG Unit 1·2)
- HANBIT Power Plant (Unit 3·4·5·6)
- HANUL Power Plant (Unit 1·2·3·4·5·6)
- KORI Power Plant (Unit 1·2 / SHIN KORI Unit 1·2)
- SAEUL Power Plant (SHIN KORI Unit 3·4)

► Configuration

- Hardware
 - Diagnostic equipment (Pinpoint IIR)
 - JIG
- Software
 - Diagnosis algorithm
 - Generation of diagnosis history/DB/report



Components

① Diagnostic equipment

- | | |
|----------------------------------|----------------------------------|
| - PC for diagnosis (Embedded) | - Oscilloscope (Embedded) |
| - Digital Multi Meter (Embedded) | - LCR Bridge (Embedded) |
| - Shorts Locator (Embedded) | - Waveform Generator (Embedded) |
| - Counter Timer (Embedded) | - Parameter Test Unit (Embedded) |

② JIG & signal cable

AC 160 Hot Panel

Introduction

Equipment that tests module function of AC160 series, PLC of ABB.

RG-P0014

➤ Features

- AC160 PLC Hot Panel Functional Test
- Long-Run test for PLC module
- Possible to install AC160 processor OS and application program for processor module(PM646A)

➤ Under application

- Kori Power Plant (SHIN KORI Unit 1)
- Wolsong Power Plant (SHIN WOLSONG Unit 1)

➤ Configuration

- Hardware
 - DUT : ABB PLC module
 - Keyboard : Industrial PC, Monitor
 - DAQ System (PXI Type)
 - Signal Conditioning Module
 - Communication card
 - Relay Matrix module
 - Power Supply (SMPS)
 - Digital Multi-meter
 - Oscilloscope
 - Electric Load
- Software
 - Function diagnosis software
 - Hot-Panel Software



Heavy Water Reactor Type (CANDU / 700MW)

SDS#1 PDC - RELAY MODULE

Introduction

Relay module for first shutdown system and emergency core cooling system in the heavy water reactor.

RG-7101-P Series

► Purpose

- Relay module of heavy water reactor type in emergency core cooling system
- Compose trip logic circuit of #1 shutdown system
- Constitute drop logic circuit of shutoff rod

► Features

- Same performance as previous prod
- Application of the latest & long-term procurable parts

► Specification

- TYPE 1 (RG-7101-P11)
 - 4 Dry Contact / Single Coil
- TYPE 2 (RG-7101-P12)
 - 2 Dry Contact / Double Coil
- TYPE 3 (RG-7101-P13)
 - 2 Dry Contact / Double Coil
- Common
 - Rating : 60W, 120VAC
 - Pull in Voltage : Max. 33.9 VDC
 - Minimum Drop Out Voltage : 4.8 VDC
 - Pull in Time : 6ms / Drop Out Time : 6ms
 - Safety Related [Q]
 - Seismic Qualification [YES]
 - Seismic Category [B / Mild]



Emergency Diesel Generator(EDG) Alarm Card

Introduction

A card that outputs an alarm signal with an alarm or lamp in case of emergency diesel generator failure.

RG-6601-P Series

► Purpose

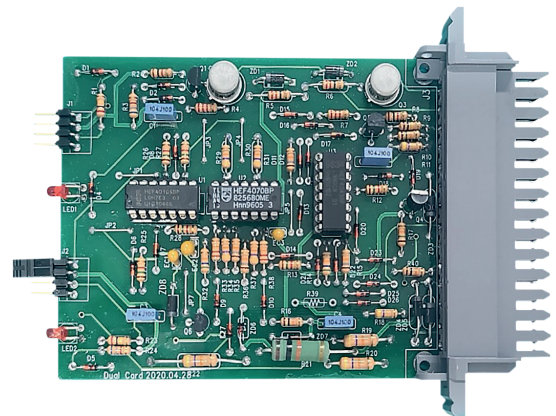
- Display the FAIL alarm for the main points of the emergency AC power system on the field panel.

► Features

- Compatible with existing equipment
- Same function as the current facility and improved durability
- Satisfying performance verification requirements (seismic resistance, electromagnetic wave test)

► Specification

- SINGLE ALARM CARD (RG-6601-P11)
 - 1 OUTPUT ALARM
 - SIZE (W * H * D,mm) : 17 * 132 * 88
 - WEIGHT (g) : 101
 - INSTALLATION : On Socket
 - RATED : 125VDC
- DUAL ALARM CARD (RG-6601-P12)
 - 2 OUTPUT ALARM
 - SIZE (W * H * D,mm) : 17 * 132 * 88
 - WEIGHT (g) : 100
 - INSTALLATION : On Socket
 - RATED : 125VDC
- Common
 - Safety Related [A]
 - Seismic Qualification [YES]
 - Seismic Category[II]
 - EMI (Reg. Guide 1.180(rev. 1)) [YES]



NIMS(NSSS Integrity Monitoring System) Cabinet

Introduction

Comprehensive system monitoring the structural integrity of the reactor cooling system.

RG-8701

➤ Purpose

- NSSS Integrity Monitoring

➤ Function

- 1) LPMS (Loose Parts Monitoring System) :
Monitoring of foreign substances Impact in the Reactor Coolant System
- 2) IVMS ([Internals Vibration Monitoring System] :
Monitoring of abnormal vibrations in the internal structure of the reactor
- 3) ALMS (Acoustic Leak Monitoring System) :
Monitoring of Leakage and cracking inside the pressure boundary
in the Reactor Coolant System
- 4) RCPVMS[Reactor Coolant Pump Vibration Monitoring System] :
Monitoring of pump shafts and bearing Fault for Reactor Coolant Pump

➤ Features

- 1) Quality: Agrade
- 2) Equipment Certification : Seismic/EMI.EMC/Environmental TEST
- 3) Perfect Compatibility with Original System

➤ Application Examples

- HANBIT Power Plant #3 (Unit 5-6)
- HANUL Power Plant #2 (Unit 3-4)
- HANUL Power Plant #3 (Unit 5-6)

➤ Specification

- 1) Size : 1219 x 912 x 2200 (W x D x H, mm)
- 2) Power : 120VAC(±10%), 60Hz
- 3) Input : LPMS 18CH, PSV 3CH, NONPSV 20CH,
IVMS 12CH, RCPVMS 24CH
- 4) Output : (Contact)
LPMS 19CH, PSV 21CH, NONPSV 40CH, RCPVMS 32CH
- 5) EnvironmentCondition
 - Operating Temperature : 21℃ ~ 25℃
 - Relative humidity : 40~60 %



* NSSS : Nuclear Steam Supply System

OPTO-COUPLER MODULE for ESFAS (Engineering Safety Features Actuation Signal)

Introduction

Used as an interface between the Engineering Safety Feature Actuation System (ESFAS) and the Power Plant Control System (PCS), serving as electrical isolation between the two systems.

RG-7001

➤ Purpose

- For ESFAS-AC (Engineering Safety Features Actuation Signal-Auxiliary Cabinet)

➤ Function

- 1) Interface for ESF (DESFAS-AC, PCS)
- 2) Output to PCS when ESF signal is matched with Selective 2/4 logic

➤ Features

- 1) Status light for Power Supply (LED)
- 2) Signal isolation for unused OPTO-COUPLER MODULE
- 3) Perfect Compatibility with Original System

➤ Application Examples

- WOLSONG Power Plant #3 (SHIN WOLSONG Unit 1-2)
- KORI Power Plant #3 (SHIN KORI Unit 1-2)
- HANUL Power Plant #3 (Unit 5-6)

➤ Specification

- 1) Size: 99 x 113.6 x 22.6 (W x H x D, mm)
- 2) Power: 24Vdc $\pm$ 10%
- 3) Input: S1, S2 : 24Vdc $\pm$ 10%
- 4) Output
 - Form A : Normal Open Contact in non-excited state during Normal Operation
 - Form B : Normal Open Contact in excited state during Normal Operation
- 5) EnvironmentCondition
 - Operating Temperature : 21°C ~ 25°C
 - Relative humidity : 40~60 %



* DESFAS : Digital Engineering Safety Features Actuation Signal

* PCS : Plant Control System

Radiation Tolerant Camera System

Introduction

The first color radiation tolerant camera was introduced in the world. The color radiation camera system has been commercially developed for the next generation of CCTV monitoring system of nuclear power plant and related facilities.

KR17090ZWC

► Features

- First Radiation Tolerant Color Camera
- High radiation tolerance & high resolution
- Easy decontamination
- Wide range of non-browning lens
- Remote control and Watertight housing

► Applications

- Surveillance of inner containment, fuel pool, turbine area, spent fuel area, waste loading
- Leakage monitoring of steam generator

► Specifications

- Type of sensor : CMOS APS
- Resolution : 512 x 512 pixels
- Illumination (min) : 4 lux
- SNR : > 40 dB

► Optical

- Lens : Non-browning lens (6x zoom)
- Angle of view : Approx. 7.4°~ 43.6°
- Operation distance (in air) : 250 mm to infinite
- Aperture range : Wide F/2.0, Tele F/3.0
- Zoom, Focus, Iris : Remote control
- Lens mount : Special type

► Mechanical

- Diameter : Ø118 mm
- Length: 462 mm
- Housing material : Stainless steel
- Front window material : Non-browning glass
- Weight : Approx. 12kg



UWC-16100PTZL II HD

► Features

- High radiation tolerance, high resolution
- Easy decontamination, Remote control, Watertight housing

► Applications

- Surveillance of fuel pool, spent fuel area
- Supervision of waste loading
- Multi-purposes radiation tolerance
- Underwater camera in the high radiation region

► Specifications

- Accu. radiation dose (Co-60) : 1×10^6 Rad
- Accu. radiation dose per hour : 1×10^5 Rad/h
- Operating temp. : 50°C, Operating pressure : 5 atm
- Pan angle : 0°C ~ 355°(+/-5°),
Tilt angle : 0°C ~ 285°(+/-5°)
- Light type : Halogen lamp (35W x 4), 850cd x 4
- Image pickup device : Color CMOS
- Resolution : 720p (HD)
- Video output : VBS : 1.0Vp-p in 75 Ohms
- SNR : > 50 dB
- Illumination (min) : 8lux
- Focal length : 5.1 mm ~ 51 mm (x10)
- Angle of view : 50°(WIDE end) ~ 5.4°(TELE end)
- Zoom ratio : x10 optical
- F-number : F1.8 to F2.1
- Dimensions (W x D x H) : 137 mm x 130 mm x 430 mm
- Housing material : Hard Anodized Aluminum & Stainless Steel
- Weight : Approx. 7.2kg in air



Radiation Tolerant Camera System

Example of installation inside Nuclear Power Plant



High Radiation Tolerant Color Camera System



Underwater Radiation Tolerant Camera



Accessories

KRDC-01

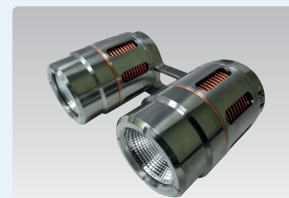
This receiver box is designed for KR17090ZWC cameras. The receiver box controls the camera and is designed to be optimized for the performance of the camera.



Receiver box

LE10

This light is optimally designed for radiation environment for a radiation tolerant camera.



Light

HPTC-120W

It is an optimal PAN/TILT with high traction by panning and tilting in a radiation environment.



PAN/TILT

Portable Inspection System

This system is dedicated to the control of the camera and display the visual signal transmitted by cameras.



Portable Inspection System

Radiation Monitoring System

Introduction

REALGAIN has a wide range product line of radiation monitoring system(RMS). RMS involves the measurement of radiation dose or radionuclide concentration for reasons related to the assessment or control of radiation exposure or radioactive substances. Each individual component of RMS is connected to a server system for monitoring purpose.

Gas PERMS

► Features

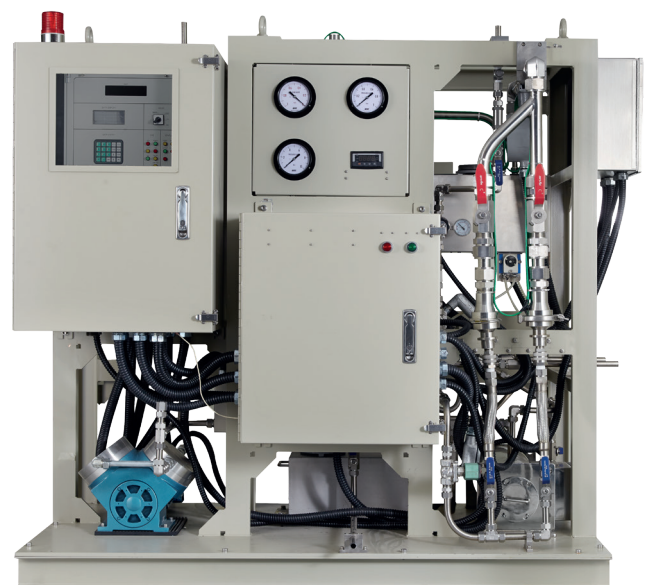
- Local Control Unit
- Distribution Box
- Particulate Moving Filter, Iodine Sampler, Gas Sampler/SKID
- Particulate, Iodine, Gas Detector
- Sampling Probe Nozzle(ANSI/HPS N13.1-1999)

► Applications

- High Energy Line Break Area Exhaust ACU Inlet Monitor
- Aux. Bldg. Controlled Area Emergency Exhaust ACU Inlet Monitor
- Containment Purge Exhaust ACU Effluent Monitor
- Containment Air Monitor
- Main Control Room Air Intake Monitor
- Fuel Handling Area Exhaust ACU Effluent Monitor
- Condenser Vacuum Vent Effluent Sampler and Monitor
- Gaseous Radwaste System Exhaust Monitor

► Specifications

- Detector Type / Collector Type
 - Particulate : Beta Scintillation / Moving Filter
 - Iodine : Gamma Scintillation / Charcoal Cartridge
 - Gas : Beta Scintillation / Chamber
- Radiation Range (Range Selectable)
 - Particulate : $3.7\text{E}-7 \sim 3.7\text{E}+1$ [Bq/cc]
 - Iodine : $3.7\text{E}-6 \sim 3.7\text{E}+1$ [Bq/cc]
 - Gas : $3.7\text{E}-2 \sim 3.7\text{E}+9$ [Bq/cc]
- Energy Range
 - Particulate : 50 KeV ~ 3 MeV
 - Iodine : 70 KeV ~ 3 MeV
 - Gas : 50 KeV ~ 3 MeV
- Equipment Qualification : Environment(IEEE-323), Seismic(IEEE-344), EMI/RFI(Reg. 1.180)



Radiation Monitoring System

Liquid PERMS

> Features

- Local Control Unit
- Distribution Box
- SKID Frame (Pump, Solenoid Valve, Flow Transmitter, Tubing Pipe, Gauge etc)
- Liquid Sampler
- Liquid Gross Gama Scintillation Detector

> Applications

- Condensate Receiver Tank Monitor
- Steam Generator Blowdown Monitor
- Component Cooling Water(CCW) Supply Header Monitor
- Condensate Polishing Sump Water Monitor
- Liquid Radwaste System Effluent Monitor
- FP & Water/Wastewater Treatment Building Effluent Monitor

> Specifications

- Detector Type / Collector Type
 - Liquid Gross Gamma / Chamber
- Radiation Range
 - Range : $3.7\text{E}-3 \sim 3.7\text{E}+3$ [Bq/cc]
- Energy Range
 - Liquid Gross Gamma : 70 KeV ~ 3 MeV
- Background Rad. Level
 - Level : $10\mu\text{Sv/hr}$
- Equipment Qualification : Environment(IEEE-323), Seismic(IEEE-344), EMI/RFI(Reg. 1.180)



Radiation Monitoring System

Area Monitor

➤ Features

- Local Control Unit
- Area Gamma Detector
- Preamplifier(If necessary)

➤ Applications

- Post Accident Primary Sampling Room Monitor
- Main Steam Line/16N Monitor
- Containment Operating Area Monitor
- Incore Instrument Room Area Monitor
- Spent Fuel Pool Area Monitor
- MS & FW Piping Penetration Area Monitor
- Fuel Storage Area Monitor
- Main Control Room Area Monitor
- TSC Area Monitor
- Normal Primary Sample Room Area Monitor

➤ Specifications

- Detector Type / Collector Type
 - Ion Chamber or GM Tube / None
- Radiation Range
 - Range : $1.0E-3 \sim 1.0E+2$ (mSv/hr) [GM Tube]
- Energy Range
 - Area Gamma : 80 KeV $\sim$ 1.5 MeV [GM Tube]
- Equipment Qualification : Environment(IEEE-323),
Seismic(IEEE-344), EMI/RFI(Reg. 1.180)



Radiation Monitoring System

Main Steam Line Monitor (N-16 Monitor)

> Features

- Local Control Unit
- Gamma Detector
- Preamplifier
- Detector Shield & Shield Mount

> Applications

- Main Steam Line/ 16N Monitor

> Specifications

- Detector Type/ Collector Type
Gamma Scintillation/ On-line
- Radiation Range
Gross Gamma: $1.0\text{E}-3 \sim 1.0\text{E}+2$ [mSv/hr]
- Energy Range
Gross Gamma: 210 KeV ~ 3 MeV
N16 : 4.5 MeV ~ 7 MeV
- Equipment Qualification : Environment (IEEE-323),
Seismic (Category II), EMI/RFI (Reg. 1.180)
- Dimension
LCU: 480(W) × 427(D) × 946(H) mm
Shield: 400(W) × 540(D) × 444(H) mm
Mount: 600(W) × 600(D) × 1270(H) mm
- Weight
about 87KG (LCU), 356KG (Shield & Mount)



Radiation Monitoring System

RMS Computer System

➤ Product Name

RMS Server System

➤ Applications

- RMS (Radiation Monitoring System) Program
- OIU (Operator Interface Unit) Program
- Peri (Peripheral) Program
- AIDI (Analog Input Digital Input) Program

➤ Specifications

RMS Server

- CPU : Intel Xeon Microprocessor
- RAM : 16~30GB
- HDD or SSD : 1~14TB RAID
(Redundant Array of Independent Disk)
- OS : WIndows Server
- Converter : SYNDC SCV-100
- Alarm Unit : SYNDC SAU-100
- Select S/W : SYNDC SSW-100
- UPS : 100~120 or 220~240 VAC/60 or 50Hz

Peri Computer

- CPU : Intel Xeon Microprocessor
- RAM : 16~30GB
- HDD or SSD : 1~14TB RAID
(Redundant Array of Independent Disk)
- OS : WIndows Server
- UPS : 100~120 or 220~240 VAC/
60 or 50Hz

OIU

- CPU : Intel I5 Microprocessor
- RAM : 8~16GB
- SSD : 256Gb
- OS : WIndows



SRDC (Safety Related Divisionalized Cabinet)

➤ Feature

- Local Control Unit
- Recorder and Class 1E isolation devices

➤ Applications

- Safety Related Divisionalized Cabinet
 - EERoom A : RE-071/073/231/233/241
 - EERoom B : RE-039/040/072/074/232/234/242

➤ Specifications

- Contact Signal
 - CPIAS(Containment Purge Isolation Actuation Signal) : RE-231,232,233,234
 - FBEVAS(Fuel Building Emergency Ventilation Actuation Signal) : RE-241,242
 - CREVAS(Control Room Emergency Ventilation Actuation Signal) : RE-071,072,073,074
- Chart Range : $3.7E-3 \sim 3.7E+3$ [Bq/cc]
- Input Signal : 4 ~ 20 mA
- Accuracy : $\pm 0.1\% \pm 1$ digit
 - Chart Size : 5.6" TFT color LCD
 - Speed : 100ms/All point
 - Alarm : 6 points
- Power : 120VAC($\pm 10\%$), 50Hz/60Hz($\pm 5\%$)



Instrumentation and Control System

Introduction

I&C systems are the central nervous system of nuclear power plant. They monitor all aspects of the nuclear power plant's condition and help respond with the care adjustment needed. REALGAIN has high performances and high quality I&C systems solutions to guarantee to our customers an absolute safety satisfaction.

Boron Concentration Monitoring System

BCMS-100

➤ Product Name

Wide Range Boron Concentration Monitor System (BCMS)

➤ Features

Monitor continuously the Boron concentration in the reactor coolant

➤ Specifications

- Count period : 1 ~ 999 seconds
- Boron concentration : 0 ~ 9000 PPM
- Input : 120 VAC 60 Hz
- I/O
 - 2 channels Isolated Analog Input
 - 2 channels Analog Input
 - 3 channels Isolated Analog Output
 - 2 channels Analog Output
 - 3 channels Isolated Digital Input
 - 8 channels Isolated Digital Output

BCMS-200

➤ Product Name

Wide Range Boron Concentration Monitor

➤ Features

Monitor continuously of the Boron concentration in the reactor coolant

➤ Specifications

- Count period : 1 ~ 999 seconds
- Boron concentration : 0 ~ 2,500 PPM
- Input : 120 VAC 60 Hz
- I/O
 - 2 channels Isolated Analog Input
 - 2 channels Analog Input
 - 3 channels Isolated Analog Output
 - 2 channels Analog Output
 - 3 channels Isolated Digital Input
 - 8 channels Isolated Digital Output



Instrumentation and Control System

GFFD

➤ Product Name

Gross Failed Fuel Detecting Monitor (GFFD)

➤ Features

Monitor continuously of the delayed neutron in the reactor coolant to check the nuclear failed fuel

➤ Specifications

- Count period : 1 ~ 999 seconds
- Count display : 101 ~ 106CPM
- Input : 120 VAC 60 Hz
- I/O
 - 2 channels Isolated Analog Input
 - 2 channels Analog Input
 - 5 channels Isolated Analog Output
 - 2 channels Analog Output
 - 3 channels Isolated Digital Input
 - 8 channels Isolated Digital Output



Power Supplies

Introduction

REALGAIN has been developed and provided the safety related power supplies for nuclear power plant. And each equipment in nuclear power plant requires different specifications of power supply. With a strong R&D experience, REALGAIN is also able to develop new power supplies on customers specifications.

SY-PS-08-01

➤ Applications

Redundant Power Supply for Process Control System (PCS)

➤ Specifications

- Dim [WxHxD] : 483mm X 222 mm X 343mm
- Input : 108 ~ 132 VAC , 1 Φ / 47-63 Hz
- Output
 - +/-15VAC/6A Voltage adjust : +/-1V
 - 24VAC
- Line regulation output
 - +/-15VDC +/-5% (Max)
 - 24 VAC
- Load regulation : +/-15VDC +/-5% (Max)
- Ripple and noise : 50mV/ 150mV



SY-PS-PCSLM

➤ Applications

Power Supply for Plant Control System (PCS)

➤ Specifications

- Dim [WxHxD] : 188mm X 312mm X 324mm
- Input : 108 ~ 132VAC/ 47 ~ 63Hz
- Outputs
 - +24VDC/16.6(MAX) (Voltage adj : +21.6V ~ +26.4V)
 - +7.5VDC/26.7A(MAX) (Voltage adj : +6.75V ~ +8.25V)
 - +15VDC/13.3A(MAX) (Voltage adj : +13.50V ~ +16.5V)
 - -15VDC/13.3A(MAX) (Voltage adj : -13.50V ~ -16.5V)
 - +24VDC/33.2A(MAX) (Voltage adj : +21.6V ~ +26.4V)
- Line regulation : 2%
- Load regulation : 2%
- Ripple : 100 mV



Power Supplies

SY-PS-ESFAS

> Applications

Multiple output power supply for Engineered Safety Features Actuation System (ESFAS)

> Specifications

- Dim [WxHxD] : 255 mm X 305 mm X 170 mm
- Input : 108 ~132 VAC, 1 Φ /47-63 Hz
- Output
 - +/-36 VDC/20A (Max) Voltage adjust : 10%
 - 24VDC/1A (Max)
- Line regulation output
 - Output 1) 36 VDC +/-1V (Max)
 - Output 2) 24VDC +/-0.1V (Max)
- Load regulation output
 - Output 1) 36VDC +/-1.7V (Max)
 - Output 2) 24VDC +/-0.8V (Max)
- Ripple and noise output
 - Output 1) 100mV
 - Output 2) 10mV
- Dynamic response : 25% Load step, 2% (any outputs)



SY-PS-PPS

> Applications

Dual output power supply for Plant Protection System (PPS)

> Specifications

- Dim [WxHxD] : 222mm X 130mm X 197mm
- Input : 108 ~132 VAC Φ /47-63 Hz
- Output : +12 VDC/13A(MAX) Voltage adjust +/-10%
- Line regulation output : +12 VDC +/-0.01 V (Max)
- Load regulation output : +12 VDC +/-0.8 V (Max)
- Ripple and noise : 5mVp-p



Power Supplies

SY-PS-ILS-06/24/48

➤ Applications

Redundant Power supply for Interposing Logic System (ILS)

➤ Specifications

- Dim [WxHxD] : 127 mm X 265 mm X 165 mm
- Input : 108 ~ 132 VAC, 1 Φ /47-63 Hz

SY-PS-ILS06 (Output : 6VDC/120A)

- Output : +6VDC/120A (Max) Voltage adjust 4.5-6.5V
- Line regulation output : 6VDC +/-0.12V (Max)
- Load regulation output : 6VDC +/-0.82V (Max)

SY-PS-ILS24 (Output : 24VDC/27A)

- Output : +24VDC/27A (Max) Voltage adjust 21.6-28.4V
- Line regulation output : 24DC +/-0.48V (Max)
- Load regulation output : 24DC +/-0.94V (Max)

SY-PS-ILS48 (Output : 48VDC/14A)

- Output : +48VDC/14A (Max) Voltage adjust 43.2-52.8V
- Line regulation output : 48VDC +/-0.96V (Max)
- Load regulation output : 48DC +/-0.96V (Max)
- Ripple and noise : 50mVp-p



SY-PS-08-02

➤ Applications

Switched-Mode Power Supply for Radiation Monitoring System (RMS)

➤ Specifications

- Dim [WxHxD] : 235 mm x 46 mm x 127 mm
- Input : 108 ~ 126 VAC, 1 Φ /47-63 Hz
- Outputs : 5VDC +/-5%, 6A
- Ripple and noise : 50mV /150mVp-p under
- Load regulation : 100% / 0% under 6.6%
100% / 10% under 3.3%
100% / 50% under 1%

- Over Voltage protection
- Over Current protection



Power Supplies

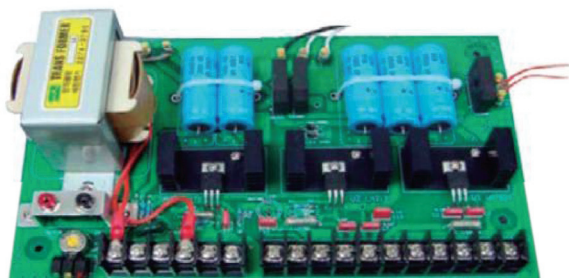
SY-PS-08-03

➤ Applications

Linear Power Supply for RMS

➤ Specifications

- Dim [WxHxD] : 223 mm x 56 mm x 139 mm
- Input : 108 ~ 126 VAC, 1 Φ /47-63 Hz
- Outputs
 - 24V IS +2V ~ 4V, 500mA
 - 24V UR 22V~ 35V, 1.0A
 - 24V R 24V ~ 26V, 300mA
 - 5V UR 6V ~ 9V, 500mA
 - 5V PF 6V ~ 9V, 500mA
 - -5V UR 6V ~ 10V, 500mA
 - -5V R -4.75V ~ -5.25V, 500mA
 - 5V AC 5V ~ 9VAC, 200mA



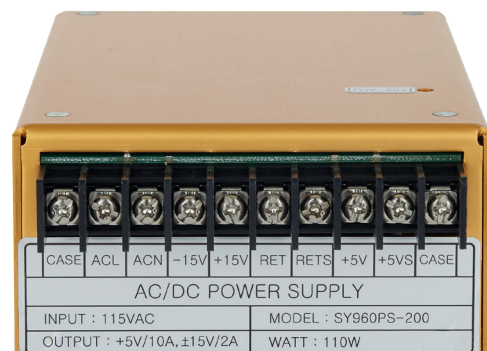
SY-960PS-200

➤ Applications

Power Supply for Local Control Unit used for RMS

➤ Specifications

- Dim [WxHxD] : 180 mm x 110 mm x 59 mm
- Input : 115VAC +/-15%
- Outputs
 - +5VDC +/-0.2% 10A
 - +15VDC +/-5% 2A
 - -15VDC +/-5% 2A
- Operating temperature : 0 ~ 50°C
- Humidity : 0 ~ 95% RH non condensing
- OVP : Over Voltage Protection
- OCP : Over Current Protection



Power Supplies

SY-PS-S2SN15

➤ Applications

Power supply for Plant Control System

➤ Specifications

- Dim [WxHxD] : 86.7 mm x 217 mm x 350 mm
- Input: 108 ~132 VAC Φ /47-63 Hz
- Output
 - +15VDC /1.5A (MAX) (Voltage adj. : +14.6 ~ +21.0V)
 - -15VDC /1.5A (MAX) (Voltage adj. : -14.6 ~ -21.0V)
- Line regulation : +15VDC +/-0.2% (Max)
- Load Regulation : 1.5% (MAX)
- Ripple and noise : 20mVrms, 50mVp-p
- Over voltage protection : +/-15VDC, +19VDC
- Over current protection : +/-15VDC, 1.7A
- Dynamic response : 25% Load step, 2%







*We will be reborn as a trustworthy
company for 10 years and 100 years.*

REALGAIN CO.,LTD.

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