

Safety Instrumented System (SIS)

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HIAGUARD SAFETY INSTRUMENTED SYSTEM

SYSTEM OVERVIEW

HiaGuard is a Safety Instrumented System (SIS) independently developed by HollySys. With the understanding and acceptance of IEC61508/IEC61511, the international standards on functional safety by end users in the process industries, safety awareness has been established. It adopts the safety structure of triple-redundancy with diagnosis (2oo3D). HiaGuard is SIL3 and CE certified by TÜV Rheinland on 12th July 2012.

It is widely applied to Emergency Shut Down (ESD), Fire & Gas Detection System (FGS), Boiler Management System (BMS), Emergency Trip System (ETS) in the process industries. The reaction time of HiaGuard is within 30ms (200 I/Os) which meets the high-speed requirements for fast response applications. HOLLiAS MACS DCS and HiaGuard SIS are able to be seamlessly integrated. The integrated solution helps customers improving the operation efficiency and reducing the system cost.

The design principles of achieving both high safety and high availability are adopted to meet the requirements of critical application.



- IEC 61508 Parts 1-7:2010
- IEC 61511: Parts 1-3:2004
- EN 50156-1: 2004
- EN 298: 2003
- EN 230: 2005
- IEC 61131-2: 2007
- IEC 61326-3-1: 2008

- EN 50130-4:1995 + A1:1998 + A2:2003
- EN 54-2:1997 + AC:1999 + A1:2006
- NFPA 72: 2010
- NFPA 85: 2011
- NFPA 86: 2011
- EN 61000-6-2:2005
- EN 61000-6-4:2007

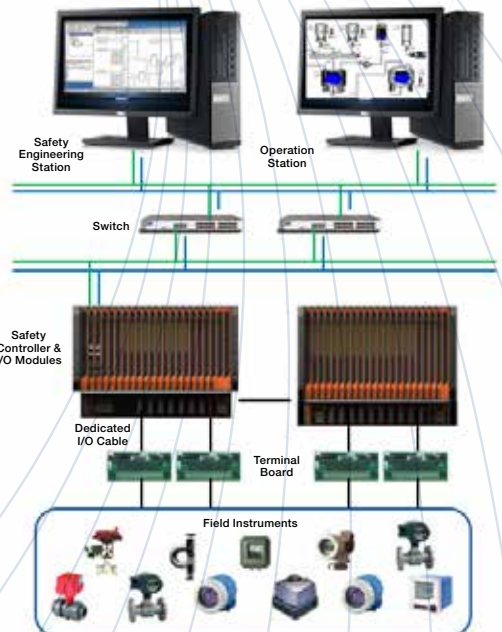
SYSTEM ARCHITECTURE

Safety Engineering Station

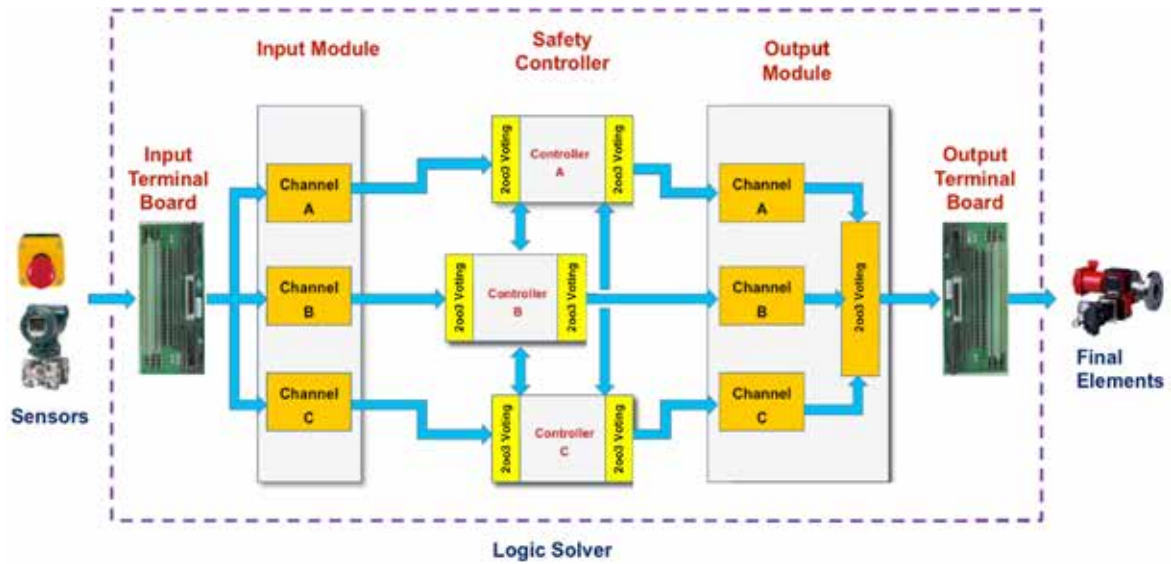
- Program language: FBD, LD (Compliant with IEC61131-3)
- Online-Monitoring
- System maintenance
- Logic simulation
- SOE viewing

Control Station (Safety Controller & I/O Modules)

- CPU: PowerPC 330MHz
- 128MB SDRAM, 1M SRAM
- 2oo3 architecture
- Triplex independent circuit in each I/O module



SAFETY ARCHITECTURE



MAXIMUM SAFETY & AVAILABILITY

High safety ensures the output of the system will be led to safety side when dangerous situation occurs and availability ensures the failure and maintenance of the system will not affect the operation.

Safety Measures

- 2oo3 voting technology with diagnostics (2oo3D)
- High diagnostic coverage and fast alert
- Physical separation reducing common cause failures
- Built-in firewall in communication module ensuring security

Enhanced Availability

- 3-2-0 degraded mode
- Independent power supply for system side and field side
- 1+1 power supply redundancy
- Redundancy configuration for communication and I/O modules
- Multi-channel failure tolerance
- Safety loop's availability up to 99.99%



APPLICATIONS IN CRITICAL CONTROL

- Emergency Shut Down (ESD)
- Fire & Gas Detection System (FGS)
- Boiler Management System (BMS)
- Emergency Trip System (ETS)



INTEGRATION WITH DISTRIBUTED CONTROL SYSTEM (DCS)

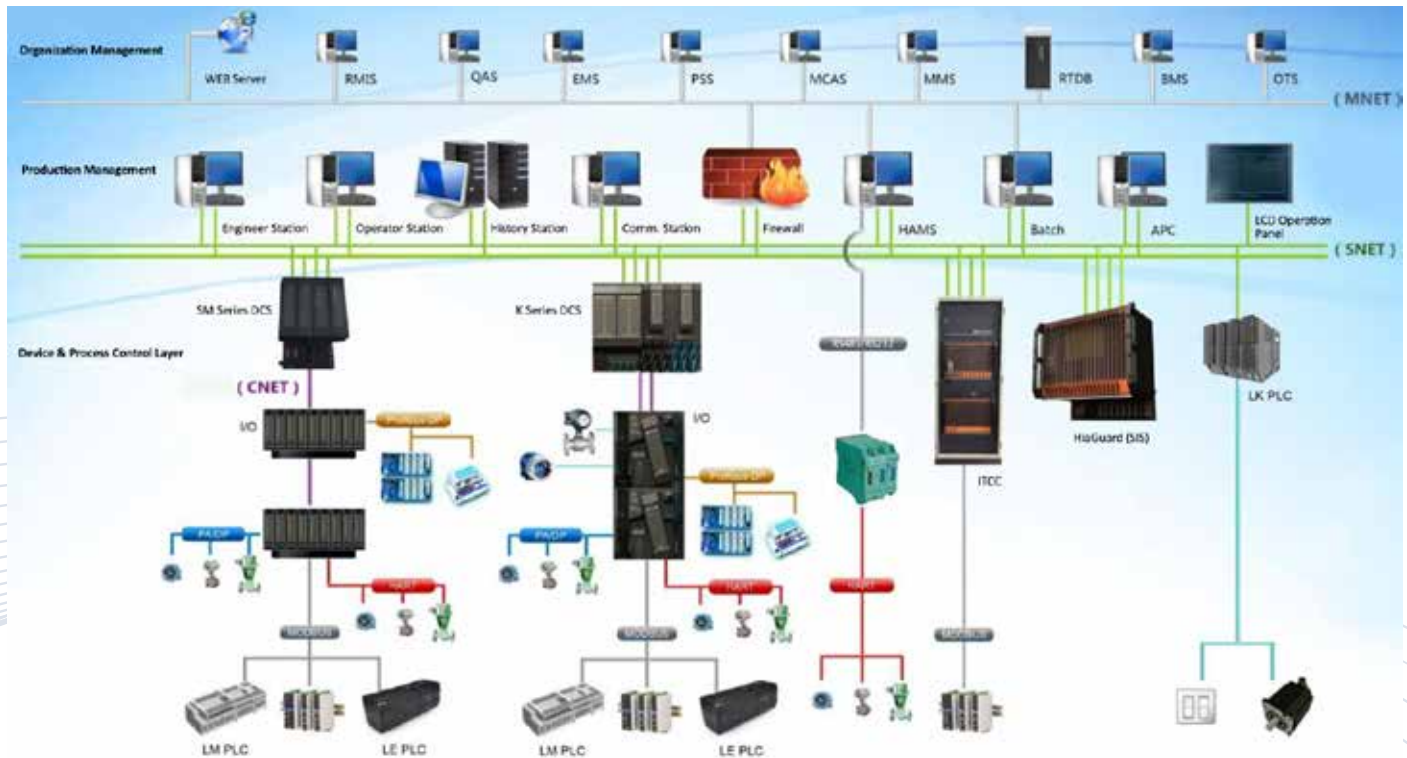
HOLLiAS MACS DCS and HiaGuard SIS are able to seamlessly integrated and the solution helps customers improving the operation efficiency and reducing the system cost.

Seamless Integration with HOLLiAS MACS DCS

- Share the system network and Human-Machine Interface (HMI)

Integration with other DCS

- Via Modbus (Supports redundancy)



SAFETY ENGINEERING TOOL

Safe-AutoThink is the component software in HiaGuard system which is an industrial control configuration software developed for industrial safety interlock instrument system by HollySys. It belongs to HollySys AutoThink software family. Safe-AutoThink runs in engineer station, and it supports to configure hardware and realize programs in languages according with IEC61131-3 standard.

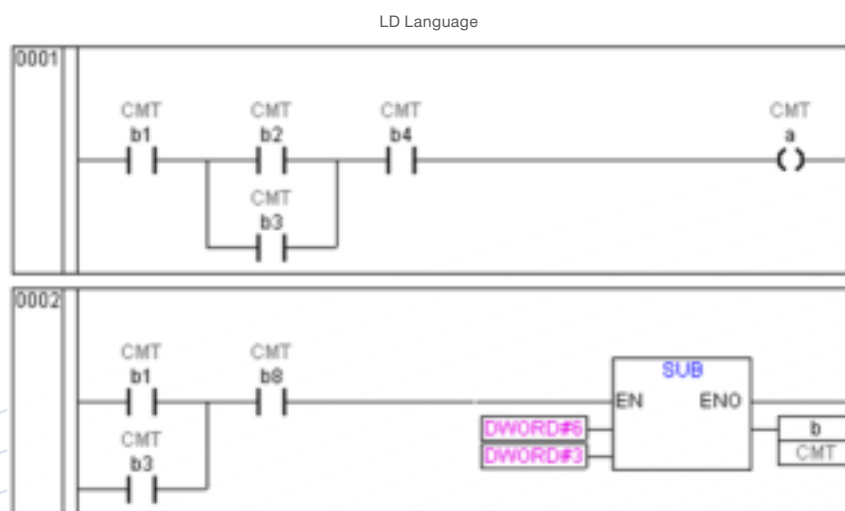
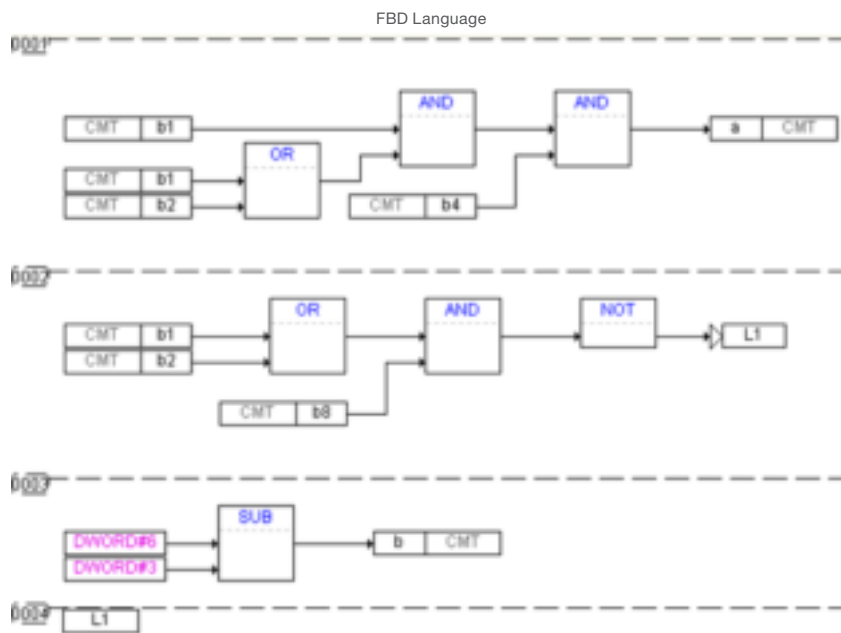
Features:

- It supports the international standard IEC61131-3
- It supports two programming languages: Ladder diagrams (LDs) and function block diagrams (FBDs). You can use more than one programming language in one project.
- It supports English and simplified Chinese.
- The Find and Replace functions can be applied to a present window or a whole project.
- It provides multi-levels password setting mechanisms
- It supports several types of online operation such as monitoring programs online, controller running and controller stopping etc.



PROGRAMMING LANGUAGES

- Supports FBD & LD, compliant with IEC61131-3



HARDWARE CONFIGURATION

SIS collects and disposes field data by hardware module. It is needed to configure hardware module according to specific project to finish collect and control task. An entity which is composed of all these devices is Field Control Station (FCS). In SIS, there are the following kinds of devices in Safe-AutoThink to achieve collecting, communicating and controlling: three-redundant controller, two-redundant communication module, various I/O modules, rack etc.

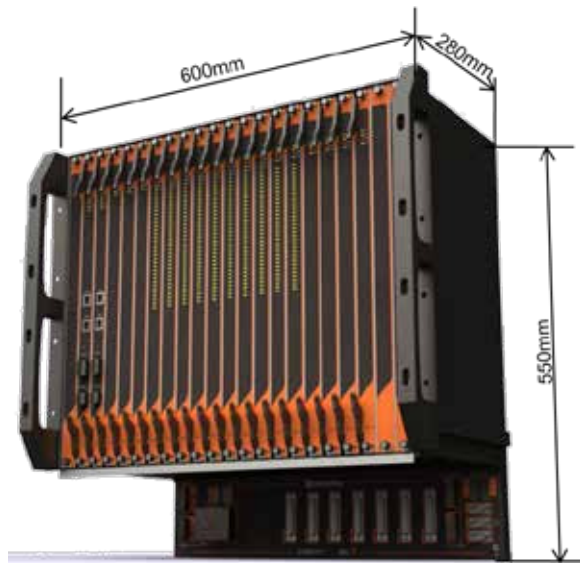
Controller and I/O modules are both 2oo3 redundant hardware structure, the communication bus between module and controller is I/O bus supporting PROFIsafe protocol.

Functions:

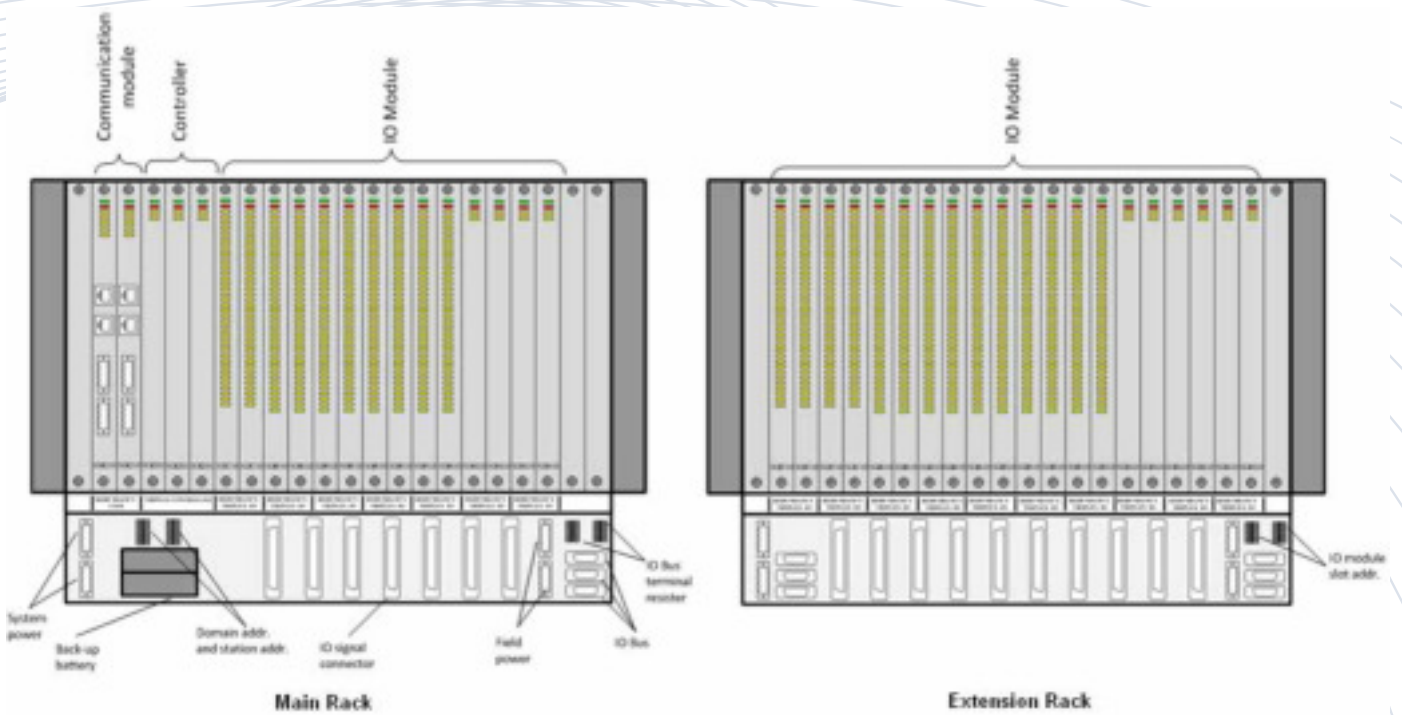
- IEC task transferring
- Receiving data from I/O modules
- Data processing
- Data voting

HARDWARE DIMENSIONS

- Rack Size: 600mm (W) × 550mm (H) × 280mm (D)
- Cabinet Size: 800mm (W) × 21000mm (H) × 800mm (D)



HARDWARE LAYOUT



HARDWARE MODULE LIST

S/N	Model No.	Description
1	SGM101	Main rack is the medium of interconnecting signals of controller, I/O modules and communication module.
2	SGM110	Expansion rack is the medium of interconnecting signals between I/O Modules.
3	SGM201	A module which has the functions of logic control operation, management of I/O module, etc.
4	SGM210	A module which is connected with controllers and used to communicate with engineer station via Ethernet. It can download engineering configuration program and report the internal information of system, it supports communication with third-party basic process control system by Modbus RTU.
5	SGM410	16-channel analog input module, which implements the field analog input acquisition function of HiaGuard.
6	SGM520	8-channel analog output module, which implements the field analog voting and output function of HiaGuard.
7	SGM610	32-channel digital input module, which implements the field digital input acquisition function of HiaGuard.
8	SGM710	32-channel digital output module, which implements the field digital voting and output function of HiaGuard.
9	SGM3410	16-channel analog input terminal board, which implements I/V conversion and the connection with AI module, and provides the over-current, static electricity and surge protection.
10	SGM3520	8-channel analog output terminal board, which implements the analog output control signal transmission, and provides the protection of channel circuits.
11	SGM3610	32-channel digital input terminal board, which implements the connection between input digital signals from field and DI module, and provides the overvoltage, over-current, static electricity and surge protection.
12	SGM3710	32-channel digital output terminal board, which implements the digital output control signal transmission, and provides the protection of channel circuits.
13	SGX002	I/O Bus communication expansion cable
14	QS10	Supplies power for the system side circuit of HiaGuard
15	QS20	Supplies power for the field side circuit of HiaGuard

1. RACK

1.1 SGM101 Main Rack

SGM101 main rack is the communication medium between HiaGuard controller, communication module and I/O module, it has the functions of configuration control station address and domain address, signal matching, and so on.



Technical Specification

Power Supply	
Input Voltage	System power supply: 24VDC (-15%~+20%), redundant Field power supply: 24VDC (-15%~+20%), redundant
Isolation Voltage	
Between Field and System	1500VAC@1min@10mA
Physical Feature	
Slot	19
Slot Setting (from left to right)	Communication module (2 slots), Controller (3 slots), I/O module (14 slots)
I/O Module Start Address	6 th
Interface	
System Power Interface	5-pin (2 sets)
Field Power Interface	5-pin (2 sets)
Domain Address	6 Switches
Control Station Address	7 Switches
I/O Bus Expansion interface	3 DB9s
I/O Bus Resistance Setting	6 Switches
DI SOE Timing Pulse Resistance Setting	6 Switches
I/O Board Module Interface	7
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

1.2 SGM110 Expansion Rack

SGM110 expansion rack is the medium of signal interconnection between the HiaGuard modules of the I/O, providing power supply, support and fixation for each module.



Technical Specification

Power Supply	
Input Voltage	System power supply: 24VDC (-15%~+20%), redundant Field power supply: 24VDC (-15%~+20%), redundant
Isolation Voltage	
Between Field and System	1500VAC@1min@10mA
Physical Feature	
Slot	20
I/O Slot Setting (from left to right)	20
I/O Module Start Address	The start address in first expansion rack is 20 th
Interface	
System Power Interface	5-pin (2 sets)
Field Power Interface	5-pin (2 sets)
Rack Address	3 Switches (2 sets)
I/O Bus Expansion Interface	6 DB9s
I/O Bus Resistance Setting	6 Switches
DI SOE Timing Pulse Resistance Setting	6 Switches
I/O Board Module Interface	10
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m

2. CONTROLLER

2.1 SGM201 Controller

SGM201 controller uses embedded fanless design and operates at ultra-low power dissipation and uses redundant 24V power supplies. The module is connected to SGM101 main rack via two european connectors. It completes the following function: acquire the input data of this channel from input modules, exchange and vote the acquired input data between three channels, logical operation, exchange and vote the output data of three modules, send the output data to output modules, and periodic diagnostic. It also exchanges data with engineer station via communication modules. The configuration of controllers of HiaGuard is 2oo3 redundancy architecture, which means that the redundant three channels consist of three SGM201 modules, and the redundant three channels controllers run synchronously in each cycles.

Features:

- Embedded 32-bit Processor, 330MHz, 8-bit ECC
- 128MByte DDR2 SDRAM
- 16MByte Nor Flash
- 1MByte SRAM
- Can be configured to 2oo3 redundancy architecture
- Point-to-point safety protocol between controllers
- Redundant power supply
- I/O Bus using PROFISafe safety protocol
- Support power lost protection
- Support hot-swap



Technical Specification

Power Supply	
Input Voltage	24VDC (-15%~+20%)
Power	600mA@24VDC (Max.)
Hot Swap	Supported

Power Supply	
Power Supply Mode	Backplane power bus
Power Supply Redundancy	Supported
CPU	
Basic Frequency	330MHz
Digit	32-bit
ECC Function	Supported
Memory	
Nor Flash	16MByte
DDR2 SDRAM	128MByte
SRAM	1MByte, with power lost retention function
LED Status	
Status	Each status LED has three status at most: Light, OFF, Flashing
Number	4
Reset	
Reset Method	Supported the manually reset by pressing button (user can touch reset button using a tool)
Power Lost Protection	
Battery Location	Placed on backplane (controller would lose power lost data protection if it is left from backplane)
Diagnostics	
Fault Diagnostics	Controller internal power supply fault Controller clock fault Controller memory fault CPU fault Fault of battery for SRAM Memory fault Project code fault Controller program code fault
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

3. COMMUNICATION UNIT

3.1 SGM210 Communication Module

SGM210 communication module is used to exchange data between controller and engineer station for HiaGuard. It supports redundant configuration and undisturbed switch-over between two modules, and all the communication ports support hot-swap. SGM210 communication module communicates with engineer station via Ethernet, which performs downloading the configuration project and uploading the information within the system. It communicates with controller via communication bus, which uploads the data of controller to engineer station. It communicates with basic process control system via Modbus RTU to implement system integration. Moreover, SGM210 accepts timing pulse of GPS timing source (FM197) and transmits timing pulse to digital input modules (SGM610).

Features:

- 32 bits embedded microprocessor, 330MHz basic frequency
- 128MByte DDR2 SDRAM
- 16MByte Nor Flash
- 1MByte SRAM
- Point-to-point safety protocol between controllers
- Active/standby redundancy
- Power supply redundancy
- System net redundancy
- Support power lost protection
- Support hot-swap



Technical Specification

Power Supply	
Input Voltage	24VDC (-15%~+20%)
Power	500mA@24VDC (Max.) 12W
Hot Swap	Supported
Power Supply Mode	Backplane power bus
Power Supply Redundancy	Supported
LED Status	
Status	Light, Flashing, OFF
Quantity	7
Reset	
Reset	Support manual reset button
Power off Protection	
Battery Setting	Mounted on backplane (when communication modules leaves backplane, the power lost protection function is lost)
Setting Mode	1 bit DIP switch settings
System Network	
Number of Interface	2
Interface Type	RJ45
Interface Characteristics	10/100Board-T(X) self-adapting, full/half duplex mode, automatic MDI/MDIX
R Bus	
Number of Interface	1
Interface Characteristics	Full-duplex mode
Communication topology	Point to Point
COM Bus	
Number of Interface	3
Interface Characteristics	Full-duplex mode
Communication topology	Point to Point
Modbus Bus	
Number of Interface	1
Interface Type	4-pin phoenix terminal
Interface Characteristics	Half duplex mode
Bus Protocol	Modbus-RTU protocol
Communication Speed	Baud rate does not support self adaption and needs configuration. Supported baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps
Electrical Standards	RS485
Master/Slave Mode	Slave
Input Timing Pulse	
Number of Interface	1
Interface Type	3-pin terminal
Interface Characteristics	Dry contact
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m

4. I/O MODULE

4.1 SGM410 Analog Input Module

SGM410 is connected to controllers and terminal board SGM3410 via the connector fixed in the rack, the field 4~20mA signal is converted to voltage signal by terminal board SGM3410 and sending signal to SGM410 module. The SGM410 module acquires the field signal, and it sends the acquired data and module diagnostic results to the corresponding controller via I/O Bus. MCU, data processing circuit, power monitoring circuit, etc. of SGM410 module are powered by the redundant system 24VDC, the channel circuits are powered by the redundant field 24VDC.

Features:

- 16-channel
- 2oo3 redundant architecture
- Software filter: Configurable
- Single channel over range, interruption and short circuit alarm
- Support hot swap
- Over-current protection



Technical Specification

Power Supply	
Input Voltage	System power supply: 24VDC (-15%~+20%), redundant Field power supply: 24VDC (-15%~+20%), redundant
Power (System)	400mA@24VDC (Max.)
Power (Field)	500mA@24VDC (Max.)
Hot Swap	Supported
Power Supply Mode	Backplane power bus
Power Supply Redundancy	Supported
Input Channel Performance Specification	
Channel	16
Software Filter	Configurable 0-15 times (default value: 0)
Signal Range	4~20mA
Channel Range	0~22mA
Accuracy	(25°C): 0.2% F.S.
Temperature Drift	≤100ppm/°C
Pass Band Upper Limit	≥100Hz
Crosstalk Rejection	≥60dB
Common Mode Rejection Ratio	≥80dB
Differential Mode Rejection Ratio	≥40dB
External Power Supply Current Limit	40mA
Full Channel Scan Time	≤3ms
Isolation Withstand Voltage	
Between Channel and System	≥1500VAC@1min@10mA
Between Channels	Not isolated
Insulation Resistance	It is greater than 100MΩ in normal state (temperature: +25°C±2°C, relative humidity: 30% ± 5%, non-condensation). It is greater than 10MΩ in hot and humid environment (temperature: +45°C±2°C, relative humidity: 95%±3%, Non-condensation).
Reset	
Power-on Reset Time	≤5s
Watchdog Reset Time	≤1s
Field Cable Impedance	
Field Cable Impedance	Input loop line resistance allowed by AI module: 0~40Ω.
Active/Standby Switchover	
Switchover Time	≤10ms
Communication	
Communication Protocol	HollySys own protocol
Safety Layer Protocol	PROFISafe V1.3 version
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

4.2 SGM520 Analog Output Module

SGM520 is connected to controllers and terminal board SGM3520 via the connector fixed in the rack and sends control signal (0~22mA) to the field device by terminal board SGM3520. It also sends module diagnostic results to the corresponding controller via I/O Bus. MCU, data processing circuit, power monitoring circuit, etc. of SGM520 module are powered by the redundant system 24VDC, the channel circuits are powered by the redundant field 24VDC.

Features:

- 8-channel
- 2oo3 redundant architecture
- Signal Range:0~22mA
- Channel self-diagnostics
- Support hot swap

Technical Specification

Power Supply	
Input Voltage	System power supply: 24VDC (-15%~+20%), redundant Field power supply: 24VDC (-15%~+20%), redundant
Power (System)	0.25A@24VDC (Max.)
Power (Field)	0.45A@24VDC (Max.)
Hot Swap	Supported
Power Supply Mode	Backplane power bus
Power Supply Redundancy	Supported
Input Channel Performance Specification	
Channel	8
Signal Type	Current output
Channel load capacity (resistive)	Max .800ohms@≥24V DC F.S.(0°C~60°C) Max .700ohms@>20.4V DC F.S.(0°C~60°C)
Output step response time	<10 ms as 10%~90% of step
Signal Range	4~20mA
Output Range	0~22mA
Accuracy	(25°C): 0.2% F.S.
Temperature Drift	≤±22uA/10°C
Safety status	0mA
Full Channel Scan Time	≤3ms
External Power Supply Current Limit	40mA
Isolation Withstand Voltage	
Between Channel and System	≥1500VAC@1min@10mA
Between Channels	Not isolated
Insulation Resistance	It is greater than 100MΩ in normal state (temperature: +25°C±2°C, relative humidity: 30% ± 5%, non-condensation). It is greater than 10MΩ in hot and humid environment (temperature: +45°C±2°C, relative humidity: 95% ±3%, Non-condensation).
Reset	
Power-on Reset Time	≤5s
Watchdog Reset Time	≤1s
Active/Standby Switchover	
Switchover Time	≤10ms
Communication	
Communication Protocol	HollySys own protocol
Safety Layer Protocol	PROFISafe V1.3 version
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

4.3 SGM610 Digital Input Module

SGM610 is a 32-channel digital input module that supports 32-channel NO (normally open) / NC (normally closed) dry contact DI signal. It uses 2oo3 redundant architecture, and the redundant three channels are in the same module of SGM610. The module is connected to the rack via the European connectors, and it is used together with terminal board to implement the function of acquiring the DI signals of 32-channel. The acquisition results are sent to the corresponding controllers via independent I/O buses of each channel. The I/O bus between SGM610 and the controller supports PROFISafe protocol. SGM610 is used as slave station to implement the I/O bus data exchange with controllers.

Features:

- 32-channel
- 2oo3 redundant architecture
- Software filtering (Configuration selectable)
- SOE accuracy is 1ms
- Over-voltage protection of channels
- Self-diagnostics of channels
- Support hot swap



Technical Specification

Power Supply	
Input Voltage	System power supply: 24VDC (-15%~+20%), redundant Field power supply: 24VDC (-15%~+20%), redundant
Power (System)	0.5A@24VDC (Max.)
Power (Field)	1A@24VDC (Max.)
Hot Swap	Supported
Power Supply Mode	Backplane power bus
Power Supply Redundancy	Supported
Input Channel Performance Specification	
Channel	32
Debounce Time	0~31.5ms (default: 10ms) configurable
Signal Type	Contact type digital input signal
Contact Type	Dry contact
Channel Type	Double-ended input
Query Voltage	24VDC (provided by DI module)
Full Channel Scan Time	≤2ms
Input Over-Voltage Protection	±36VDC, 1 min
Isolation Withstand Voltage	
Between Field-Side and System-Side	≥1500VAC@1min@10mA
Reset	
Power-on Reset Time	≤5s
Watchdog Reset Time	≤1s
Cable	
Cable	Resistance of signal cable from terminal board to field instrument shall less than 50Ω and capacitor shall less than 100nF.
Active/Standby Switchover	
Switchover Time	≤10ms
SOE	
Timing Mode	Hardware timing
Accuracy	1ms inside control station, 1ms between control station
Timing Interface	
Timing Interface	Calibrates counters of itself by the timing pulse which sent by communication module and received by timing pulse interface.
Communication	
Communication Protocol	HollySys own protocol
Safety Layer Protocol	PROFISafe V1.3 version
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C

Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

4.4 SGM710 Digital Output Module

SGM710 is the 32-channel voltage-type digital output module. It uses 2oo3 redundant architecture and the redundant three channels are in the same module of SGM710. The module is connected to the rack via European connectors and it is used together with terminal board to implement the voting and output of the field digital signal. I/O bus between SGM710 and controller supports the PROFISafe safety protocol. SGM710 is used as the slave station to implement the I/O bus data exchange with controllers.

Features:

- 32-channel
- 2oo3 redundant architecture
- Channel over-voltage protection
- Channel self-diagnostics
- External cable fault detection
- Support hot swap



Technical Specification

Power Supply	
Input Voltage	System power supply: 24VDC (-15%~+20%), redundant Field power supply: 24VDC (-15%~+20%), redundant
Hot Swap	Supported
Power Supply Mode	Backplane power bus
Power Supply Redundancy	Supported
Channel Performance	
Channel	32
Channel Type	Source
Assignment Time for Full Channel	≤2ms
Over Voltage Protection	±30V DC
On-state Voltage Drop	≤3V
Maximum of Output Low Voltage	≤2.4V
Drive Capability	Support DC-13 load type specified in IEC 60947-5-1 Single channel 24VDC@0.5A The total current for the module drive ≤8A
Isolation Withstand Voltage	
Between Channel and System	≥1500VAC@1min@10mA
Between Channels	Not isolated
Reset	
Power-on Reset Time	≤5s
Watchdog Reset Time	≤1s
Active/Standby Switchover	
Switchover Time	≤10ms
Communication	
Communication Protocol	HollySys own protocol
Safety Layer Protocol	PROFISafe V1.3 version
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

5. I/O TERMINAL BOARD

5.1 SGM3410 Analog Input Terminal Board



Features:

- EMC protection
- Over-current protection

Technical Specification

Channel Features	
Total Channels	16
Input Impedance	250Ω
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Anticorrosion Standard	ANSI ISA-S71.04-1985 G3 Certificate
Physical Feature	
Installation	DIN35 rail mounting
Dimension	230.5mm*125.3mm*2mm
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

5.2 SGM3520 Analog Output Terminal Board

Features:

- EMC protection

Technical Specification

Channel Features	
Total Channels	8
Channel Protection	Short protection and over voltage (±30V DC) protection
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Anticorrosion Standard	ANSI ISA-S71.04-1985 G3 Certificate
Physical Feature	
Installation	DIN35 rail mounting
Dimension	230.5mm*125.3mm*2mm
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

5.3 SGM3610 Digital Input Terminal Board

Features:

- Over-current protection
- Overvoltage protection

Technical Specification

Channel Features	
Total Channels	32
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Anticorrosion Standard	ANSI ISA-S71.04-1985 G3 Certificate
Physical Feature	
Installation	DIN35 rail mounting
Dimension	230.5mm*125.3mm*2mm
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

5.4 SGM3710 Digital Input Terminal Board

Features:

- Over-current protection
- Overvoltage protection

Technical Specification

Channel Features	
Total Channels	32
Channel Protection	Over current protection, the rated current is 1.25A
Environment	
Operating Ambient Temperature	0~60°C
Relative Humidity of Working Environment	5%~95%, non-condensation
Storage Ambient Temperature	-40°C~85°C
Relative Humidity of Storage Environment	5%~95%, non-condensation
Altitude	≤2000m
Anticorrosion Standard	ANSI ISA-S71.04-1985 G3 Certificate
Physical Feature	
Installation	DIN35 rail mounting
Dimension	230.5mm*125.3mm*2mm
Safety Specification	
Systematic Capability	SC3 acc. to IEC 61508
Hardware Integrity Level	SIL3 acc. to IEC 61508

6. CABLE

6.1 SGX002 I/O Bus Communication Expansion Cable

SGX002 I/O bus communication expansion cable completes I/O bus communication expansion between main rack and expansion rack, or between two expansion racks, the cable has shielding protection.

Technical Specification

Specification	
Average outside diameter (d)	7mm
Long	1.8m
Connect method	Directly connect
The minimum bend radius	Fixed installation: 7.5*d Others: 10*d

REFERENCE

No.	Client	Equipment	Application
1	M/s. Lanco Solar Private Limited	Large Solar Polysilicon (1500 TPA)	HOLLiAS MACS-K DCS and HiaGuard SIS
2	SGEC Heavy Engineering Limited / National Thermal Power Corporation Limited (NTPC)	Captive Power Plant (2 x 20MW)	HOLLiAS MACS-K DCS and HiaGuard SIS
3	Ningxia Boyong Petrochemical Company Limited	160,000 tons / year alkylation	Emergency Shutdown Systems (ESD)
4	Luxi Chemical Group Co., Ltd	180,000 tons / year hydrogen peroxide	Emergency Shutdown Systems (ESD)
5	Hefei Gas Group	Liquefied Natural Gas (LNG)	Emergency Shutdown Systems (ESD) Fire and Gas Detection Systems (F&G)
6	Shandong Huaxiang Yanhua Co., Ltd	360,000 / year ion-exchange membrane caustic soda	Emergency Shutdown Systems (ESD)
7	Shandong Huachao Chemical Co., Ltd	200,000 tons / year isobutane dehydrogenation isobutylene isomerization, MTBE	Emergency Shutdown Systems (ESD)
8	Hubei Sanning Chemical Industry Company Limited	Fertilizer	Integrated Turbine / Compressor Control System (ITCC)
9	Shanxi Guangda Jiaohua Qiyuan Limited Company	Methanol	Integrated Turbine / Compressor Control System (ITCC)
10	Inner Mongolia Hongyu Technology Co., Ltd	300,000 tons / year of synthetic ammonia, 500,000 tons / year of urea	Integrated Turbine / Compressor Control System (ITCC) Emergency Shutdown Systems (ESD)
11	Jilin Province Li'an Petrochemical Co., Ltd.	Polypropylene	Emergency Shutdown Systems (ESD)
12	Shandong Zhonghai Fine Chemical Co., Ltd	Catalytic Cracking	Emergency Shutdown Systems (ESD)
13	Anhua Huaxing Chemical Industry Co., Ltd	100,000 tons of ion-exchange membrane caustic soda	Emergency Shutdown Systems (ESD)
14	Anhui Jinhe Industry Co.,Ltd.	Liquid Ammonia Tank Area	Emergency Shutdown Systems (ESD)
15	Shandong FangYu Lubricating Oil Co., Ltd	600,000 tons / year lubricating oil hydrogenation	Emergency Shutdown Systems (ESD)
16	Shandong Shenxian Huaxiang Petrochemical Co., Ltd	Oil Quality Upgrade	Emergency Shutdown Systems (ESD)
17	Beijing Nangong Incineration Plant	Garbage Power Generation	Burner Management Systems (BMS)
18	Shandong Liaocheng Luxi Polycarbonate Co., Ltd	Polycarbonate	Emergency Shutdown Systems (ESD)
19	Jiangsu Changlong Nonghua Limited Company	Liquid Chlorine and Phosgene Synthesis	Emergency Shutdown Systems (ESD)
20	Jiangsu Thorpe (Group) Co., Ltd	100,000 tons / year ion-exchange membrane caustic soda	Emergency Shutdown Systems (ESD)
21	Nanjing Bote New Materials Co., Ltd	Ethylene Oxide Tank	Emergency Shutdown Systems (ESD)
22	Jiangxi Yingpeng Chemical Co., Ltd	Hydrofluoric Acid	Emergency Shutdown Systems (ESD)
23	Langfang Xinzhi Sludge Treatment Technology Co., Ltd	Water Treatment	Emergency Shutdown Systems (ESD)
24	Haili Guixi Chemical Pesticides Co., Ltd	Pesticide	Emergency Shutdown Systems (ESD)
25	Shanxi Tianze Coal Chemical Group Corporation	Synthetic Ammonia	Emergency Shutdown Systems (ESD)
26	Jiangsu Zhongteng Chemical Co., Ltd	Oxidation, Chlorination	Emergency Shutdown Systems (ESD)
27	Henan Yongchang Chemical Nitroso Fertilizer Co., Ltd	Nitric acid	Emergency Shutdown Systems (ESD)
28	Dalian Lufeng Chemical Co., Ltd	Ion-exchange membrane caustic soda	Emergency Shutdown Systems (ESD)
29	Liaocheng Coal New Materials Technology Co., Ltd.	Hydrogen Peroxide	Emergency Shutdown Systems (ESD)
30	Shandong Yuanli Technology Co., Ltd	Maleic Anhydride	Emergency Shutdown Systems (ESD)

No.	Client	Equipment	Applicatio76
31	Taizhou Xin'an Flame Retardant Material Co., Ltd	Storage Tank	Emergency Shutdown Systems (ESD)
32	Anhui Jinhe Industry Co.,Ltd.	Sucrose	Emergency Shutdown Systems (ESD)
33	Hebei Zhuotai Fertilizer Industry Co., Ltd	Propylene Oxide	Emergency Shutdown Systems (ESD)
34	Jiangsu Huaihe Chemical Co., Ltd.	Methyl Aniline	Emergency Shutdown Systems (ESD)
35	Henan Shunda Chemical Technology Co., Ltd	Methanol	Emergency Shutdown Systems (ESD)
36	Nanjing Yangzi Petrochemical Lianhua Co., Ltd	Liquid Hydrocarbons	Emergency Shutdown Systems (ESD)
37	Yancheng Hengsheng Chemical Co., Ltd	Liquid Chlorine Tank	Emergency Shutdown Systems (ESD)
38	Shandong Xinhecheng Pharmaceutical Industry Co., Ltd.	Pharmaceuticals	Emergency Shutdown Systems (ESD)
39	Inner Mongolia Hasee Guiye Co., Ltd	Distillation tank area	Emergency Shutdown Systems (ESD)
40	Shouguang MaoLong New Material Technology Development Co., Ltd	Electricity	Burner Management Systems (BMS)
41	Guangdong Dingfeng Paper Industry Co., Ltd	Electricity	Burner Management Systems (BMS)
42	Shuangyashan Sanju Huaben New Energy Co., Ltd	Liquefied Natural Gas (LNG)	Emergency Shutdown Systems (ESD)
43	Shuangyashan Sanju Huaben New Energy Co., Ltd	Gas	Emergency Shutdown Systems (ESD)
44	New Solar Technology Group Co., Ltd.	600,000 tons of ethylene benzene 300,000 tons of styrene joint device	Emergency Shutdown Systems (ESD)
45	Shandong Sub-Environmental Technology Co., Ltd	Cyclohexanone	Emergency Shutdown Systems (ESD)
46	Shandong Jincheng Petrochemical Group Co.,Ltd.	Methanol Hydrogen Production	Emergency Shutdown Systems (ESD)
47	Hebei Haoze Chemical Co., Ltd	100KTA latex	Emergency Shutdown Systems (ESD)
48	Hubei Xingfa Chemicals Group Co., Ltd	Ammonia station	Emergency Shutdown Systems (ESD)
49	Shandong Shouguang Jianyuanchun Chemical Co., Ltd	New Material	Emergency Shutdown Systems (ESD)
50	Hebei Changfeng New Energy Technology Co., Ltd	Formamide	Emergency Shutdown Systems (ESD)
51	Jiangxi Poyanghu Liquefied Natural Gas Co., Ltd	(LNG) Storage & Distribution	Emergency Shutdown Systems (ESD)
52	Jinhe Biotechnology Co., Ltd	Thermoelectric	Burner Management Systems (BMS)
53	Guangxi Guangming Wharf Storage Co., Ltd	Reservoir	Emergency Shutdown Systems (ESD)
54	Luoyang Shuangruiwan Jitaiye Limited Company	Sponge Titanium	Emergency Shutdown Systems (ESD)
55	Henan Yongchang Nitroso Fertilizer Co., Ltd.	270,000 tons of Nitric Acid	Emergency Shutdown Systems (ESD)
56	Jiangsu Lihong Technology Development Co., Ltd	Polyurethane	Emergency Shutdown Systems (ESD)
57	Hubei Chuxing Chemical Industry Company Limited	Liquid Ammonia Tank	Emergency Shutdown Systems (ESD)
58	Xinjiang Oriental Xiwang New Energy Co., Ltd	15,000 tons of Polysilicon	Emergency Shutdown Systems (ESD)
59	Qingdao Shuangtao Jingxi Chemical Industry (Group) Limited Company	Solid Sodium Silicate	Emergency Shutdown Systems (ESD)
60	Xingtai Xinlanxing Technology Co., Ltd.	Pesticide Manufacturing	Emergency Shutdown Systems (ESD)
61	Sinopec Yangzi Petrochemical Company Ltd.	Desulfurization	Emergency Shutdown Systems (ESD)
62	Taixing Meilan New Material Co., Ltd	Hydrofluoric Acid Tank Area	Emergency Shutdown Systems (ESD)
63	Dalian Chemical Industry (Jiangsu) Limited Company	Emulsion	Emergency Shutdown Systems (ESD)
64	Jining Chenguang Coal Chemical Co., Ltd	Phthalic Anhydride	Emergency Shutdown Systems (ESD)
65	Tengzhou Shengyuan Hongda Chemical Co., Ltd	Toluene	Emergency Shutdown Systems (ESD)
66	Junan Guotai Chemical Co., Ltd	Thionyl Chloride	Emergency Shutdown Systems (ESD)
67	Shandong Hualu Hengsheng Chemical Co., Ltd	Urea	Emergency Shutdown Systems (ESD)
68	Shandong Derek New Materials Co., Ltd.	Rubber Auxiliaries Chlorinated Units	Emergency Shutdown Systems (ESD)
69	Ji Lin Sheng Jun Hui Energy Group Co., Ltd	Oil Storage	Emergency Shutdown Systems (ESD)
70	Anhui Huaihua Co., Ltd	Nitric Acid	Emergency Shutdown Systems (ESD)
71	Zhejiang Lanxi Ju Hua Fluorine Chemicals Co., Ltd	Benzoic Acid	Emergency Shutdown Systems (ESD)
72	Shaowu Yongtai Gao New Materials Co., Ltd	New Materials For Hexafluoride	Emergency Shutdown Systems (ESD)
73	Fujian Yongfu Chemical Industry Limited Company	Hydrofluoric Acid	Emergency Shutdown Systems (ESD)
74	Wanli Chemical Industry Co., Ltd. (Northwest Gate)	Methanol	Emergency Shutdown Systems (ESD)
75	Beijing Yongxing Environmental Protection Co., Ltd	Waste Disposal	Emergency Shutdown Systems (ESD)
76	Wengfu Dazhou Chemical Industry Co.,Ltd	Ammonium Phosphate, Liquid Ammonia Station	Emergency Shutdown Systems (ESD)
77	Shandong Jinqi Mingshui Chemical Group Co., Ltd	Synthetic ammonia	Emergency Shutdown Systems (ESD)
78	Jiangxi Gemei Fluorine Chemical Co., Ltd	Pentafluoroethane	Emergency Shutdown Systems (ESD)
79	Shandong Huayang Pesticide Chemical Group Limited Company	Phosgene	Emergency Shutdown Systems (ESD)
80	Zhuhai Refining Petrochemical Co., Ltd	Deep Processing of Lubricating Oil	Emergency Shutdown Systems (ESD)
81	Langfang Xinzhi Sludge Treatment Technology Co., Ltd	Natural Gas Liquefaction	Emergency Shutdown Systems (ESD)
82	Nanjing Zhongteng Chemical Co., Ltd.	Oxidation, Chlorination	Emergency Shutdown Systems (ESD)

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