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HollySys

Process Automation with DCS

HOLLiAS MACS
Distributed Control System

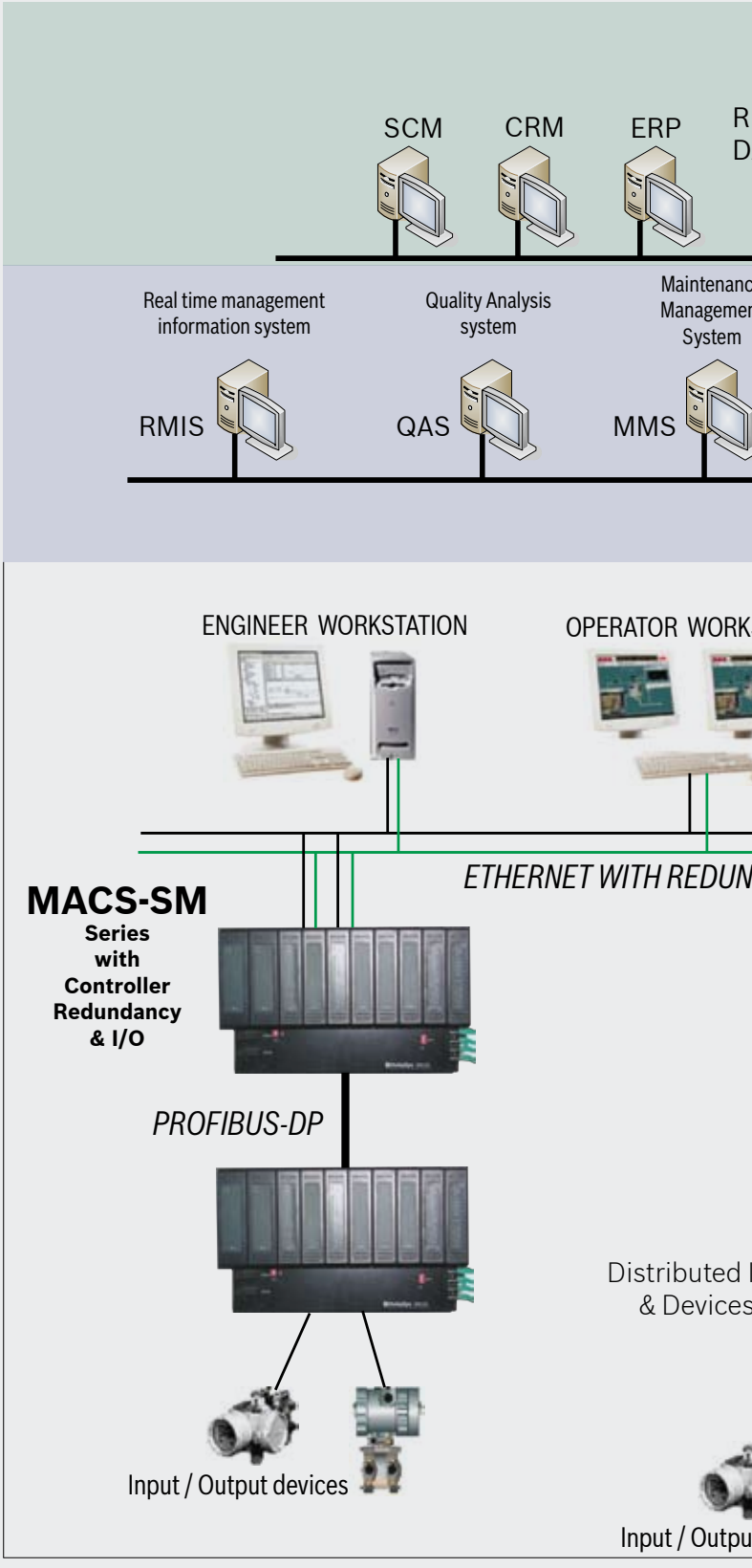
HOLLiAS MACS DCS

MACS DISTRIBUTED CONTROL SYSTEM

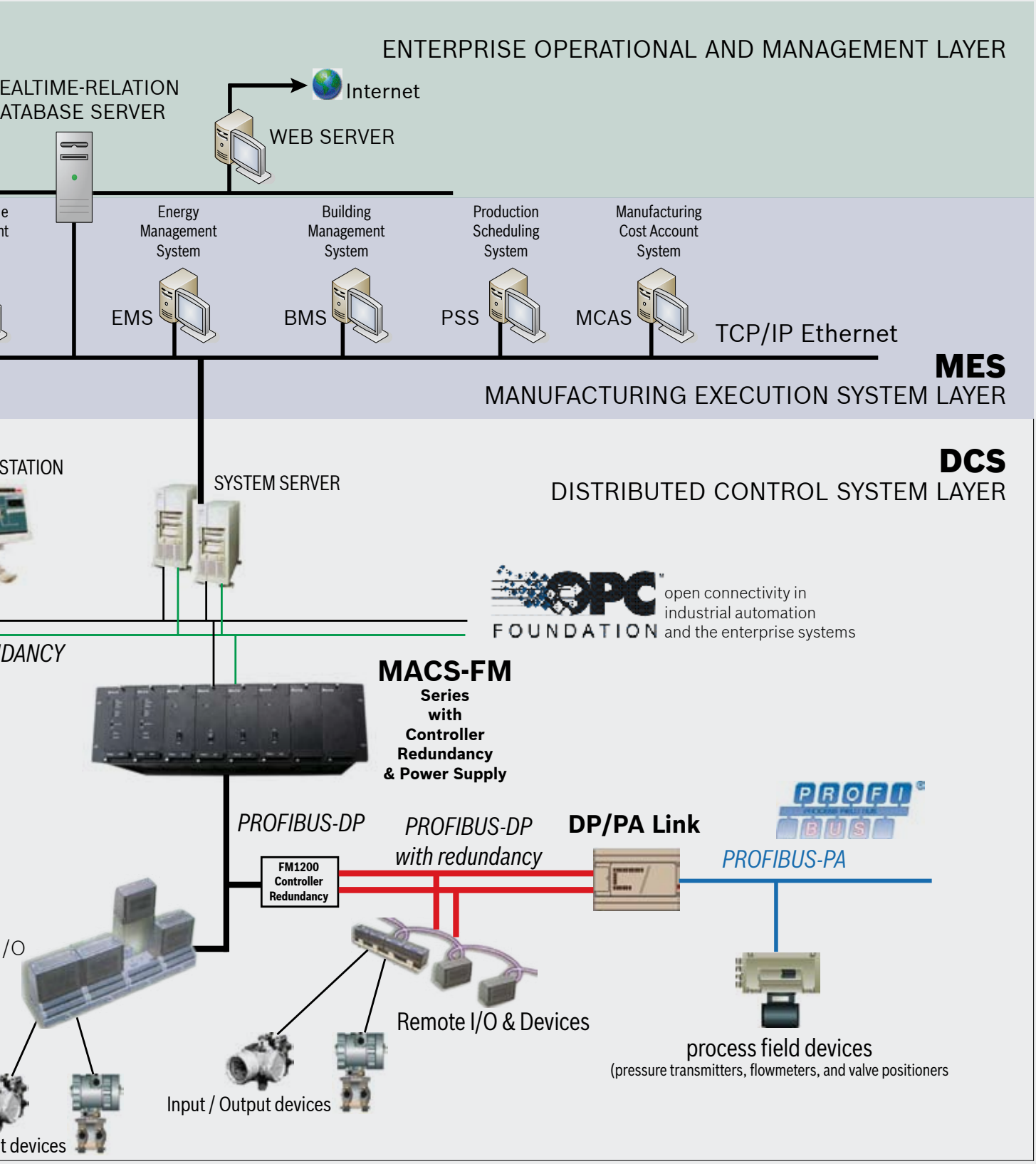
Distributed Control System (DCS) refers to a control system used in process control or continuous manufacturing which the controller elements are not centralized in a location but are distributed throughout the system. Each component's subsystems are controlled by one or more controllers. The entire system of controllers are connected through a network for communicating, controlling, and supervising.

In the fast changing industry of process automation, it is not just about technology and control, but more importantly, it is about getting the job done correctly. There is a rising demand for more critical advanced control system with greater management features to improve the entire enterprise's competitiveness and competence, to reduce energy consumption and pollution, and to achieve sustainable development. At HollySys, we have ten years experience on DCS platform for the plant managers, engineers, and control room operators. Such requirements promote the development of a new generation DCS featuring total integration. We are proud to recommend to you our fourth generation DCS solution, the HOLLiAS MACS DCS.

As a leading supplier in automation control industry, HollySys developed the fourth generation control system platform – HOLLiAS, based on international advanced automation control technology. Inherited the best characteristics of our previous DCS, the HOLLiAS MACS DCS brings you the next evolutionary step providing better information visibility, critical control, performance, and operational agility. It is an open system platform that is extremely reliable, flexible to configure by providing a complete solutions to your plant automation needs.



The perfect process automation and control with enterprise level management based on the fully integration of DCS, PLC, MES, and enterprise management.



SYSTEM ARCHITECTURE OF HOLLiAS MACS DCS

The Overview of HOLLiAS MACS DCS

HollySys developed China's first Distributed Control System in 1993 and since then we have been improving our DCS solutions. HOLLiAS MACS DCS is our fourth generation DCS, a hardware and software platform for the modern automation industries demonstrating high state of art technology. Delivering the perfect process control and overall enterprise level management, the HOLLiAS MACS DCS platform is widely used in the process industries. Examples of industries application are thermal power, nuclear power, oil and gas, petrochemical, chemicals, pharmaceuticals, paper and pulps, metals and minerals, cement, beverage, glass, metallurgical, water treatment, and environmental protection.

Profibus-DP

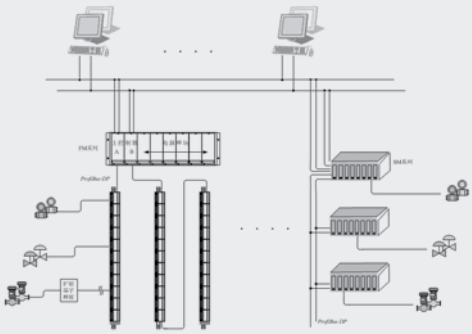
In 1999, HollySys utilized the Profibus-DP core technology with the physical and link layer of the master and slave stations.

Features

- Adopting industrial Ethernet technology, to ensure real-time communication, to improve stability, network security, and safety.
- Adopting the widely used Profibus-DP fieldbus technology, to achieve the following advantages:
  - Fulfilling decentralized risks and control, as well as centralized supervision in real time.
  - I/O modules can be centralized or decentralized as per field situations to save cable costs.
  - Profibus-DP was accepted in 2001 as the fieldbus standard for the industrial automation industry. Systems and equipment following this standard have been widely applied in various industries. Hence, HOLLiAS MACS DCS can easily communicate and exchange data with field devices or instruments from different suppliers or different branding.
- By offering two system models to choose from depending all on your application and size of installation. The MACS-FM series and MACS-SM series.
  - The MACS-FM series is suitable for medium-scale and large-scale projects (within 10,000 physical points in terms of scale) with high-density installation architecture.
  - The MACS-SM series is suitable for large-scale and ultra large-scale projects (within 100,000 physical points in terms of scale) with moderate density installation architecture.
- Flexible system architecture equips with wide I/O ranges from tens to hundreds of thousands to adapt to different application.
- Open system:
  - The system supports and provides OPC industrial standard interface based on COM/DCOM technology to standardize software interfaces between equipment and application programs from different suppliers.
  - The system can be easily connected with Profibus-PA smart transmitter or actuator through coupler or DP/PA link.

HOLLiAS MACS System Architecture

Data Communications Network



Operational Level

The data communication of operational level is known as system network (SNET). SNET is used for data and resource connection, sharing, and printing between engineer stations, operator stations, system servers and field control stations.

SNET is redundant-capable to support real-time industrial Ethernet with star, loop, or bus topology structure. It follows the IEEE802.3 and IEEE802.3u standards with adaptable baud rate of 10/100Mbps and uses category 5 twisted pair or optical fiber with RJ-45 connection as transmission medium. Based on a reliable industrial Ethernet communication protocol, the transmission of data can be more open, real-time, and reliable.

Control Level

The data communication of control level is known as control network (CNET). CNET adopts Profibus-DP industrial fieldbus to communicate with I/O modules and devices or instruments in automation system, in order to deliver real-time, speedy, and efficient process or field communication tasks. It follows the IEC61158 international standard (national standard JB/T10308.3-2001/European standard EN50170).

Profibus-DP adopts poll communication between the master and slave stations with a maximum baud rate that achieves 12Mbps, ideally. Profibus-DP link can be connected to a maximum of 126 nodes (0~125). Multiple communication mediums are applicable, including twisted pair, optical fiber, or a mixture of both. Maximum communication distance of twisted pair can reach 1.2km, while single-mode optical fiber can reach 10km, with complete diagnosis function to facilitate system maintenance.

Hardware

HOLLiAS MACS system hardware includes the following:

Engineer Station

Engineer Station consist of a high-performance computer with DCS configuration software. It is used to perform DCS configuration and upload operational parameters to the field control station and operator station.

Operator Station

Operator station consist of high-performance computer with optional touch screen HMI display. It is used to monitor the production process, conduct controls, and check the running status of the system network, controllers, and I/O modules in field control station.

Field Control Station

Field control station consists of the field controllers, I/O modules, power supply modules, terminal modules resides in the control cabinets. It does signal collection, conversion, various control and interlock algorithm, field signal output, etc. It also perform self-diagnosis of its operational status. HOLLiAS MACS DCS offers FM and SM series modules for flexible configuration.

System Server (optional)

High-performance server is used to fulfill the management, accessing, data processing, and communication of real-time database and historical database. System server supports redundancy and can be configured according to project scale.

Specification

A large-scale HOLLiAS MACS DCS can include multiple groups of servers. System can be divided into multiple domains. Each domain consists of certain number of engineer stations, operator stations, system servers, and field control stations, to enable relatively independent data collection and equipment control functions. Engineer station and operator station can operate on different domains by login.

Maximum Capacity	
Engineering domain	8
Server	1 pair per domain (redundant)
Engineer station	16 sets per domain, 1 set per domain in normal conditions, multiple engineer stations allowed.
Operator station	32 sets per domain
Field Control Station	64 sets per domain
Controller	1 pair per control station (redundant)
I/O Modules	126 nodes (0~125) per control station (≤ 72 per control station is recommended for decentralization)
System Margin	
Controller CPU peak load rate	< 40%
Memory margin	Around 30%
Data network load rate	< 20%
Power supply load margin	> 40%
Reliability	
MTBF	≥200,000h
System availability	≥99.9%
Response Time	
Minimum real-time data scan cycle	50ms
Minimum loop control cycle	50ms
Minimum logic control cycle	50ms
Real-time graph response time	≤1s
System Network	
Communication protocol	IEEE802.3/u, TCP/IP or industrial Ethernet protocol
Network structure	Real-time industrial Ethernet
Communication medium	Twisted pair cable category 5 or Optic fiber
Baud rate	100Mbps
Control Network (I/O bus)	
Communication protocol	Profibus-DP
Network structure	Bus / Tree
Communication medium	Shielded twisted pair or fiber optics
Baud rate	Max. of 12Mbps; Typical 1.5Mbps, 500kbps
System Accuracy	
AI accuracy	≤0.1%
AO accuracy	≤0.2%
SOE time resolution	1ms
Signal Interface	
AI signal type, I/O range	0~5V, 0~10V, 0~10mA, 0 (4) ~20mA
Thermocouple signal type	J, K, N, E, S, B, R, T
RTD signal type	Cu 50, Pt100

AO signal type	4 ~ 20mA (max load 750 Ω)
DI signal type	Dry contact/24VDC/48VDC/220VAC
DO maximum load capacity	Transistor output: 50mA/30VDC; Relay output: 4A/220VAC, 1A/110VDC
Pulse Input, maximum frequency	10KHz (positive pulse)
Power Supply	
AC input voltage	
FM Power supply	90~250VAC, 50/60Hz±2Hz
SM Power supply	90~250VAC, 50/60Hz±2Hz
Power supply for redundancy	1:1 flow equalization redundancy
Input output isolation pressure resistance	3000Vrms
System Anti-disturbance Capability	
AI channel CMRR	≥90dB
AI channel DMRR	≥60dB
Input loop isolation strength	≥500Vrms
EMC	
Electrostatic discharge immunity test	IEC61000-4-2 1995 level 3
Electrical fast transient/burst immunity test	IEC61000-4-4 1995 level 3
Surge immunity test	IEC61000-4-5 1995 level 3
Radiated, radio-frequency, electromagnetic field immunity test	IEC61000-4-3 1995 level 3
Immunity test for conducted disturbances induced by radio-frequency fields	IEC61000-4-6 1996 level 3
Voltage dips, interruption and voltage variations immunity test	IEC61000-4-11 1994 level 3
System Working Environment	
Working temperature	
FM I/O	0℃ ~45℃
SM I/O	0℃ ~50℃
Storage temperature	
FM I/O	-15℃ ~ 65℃
SM I/O	-20℃ ~ 70℃
Working humidity	5~95% relative humidity, non-condensing
Storage humidity	5~95% relative humidity, non-condensing
Ingress Protection	
FM I/O	IP40
SM I/O	IP20
Cabinet	IP41
Vibration and shock	
Vibration range	Maximum 7.5mm (5~9Hz)
Acceleration	Maximum 2.0g

DRTE Protocol for the Industrial Ethernet

As DCS technologies move toward standardization and open architecture fulfilling interoperability, DCS systems developed in the later half of 1990s adopted standard Ethernet and TCP/IP protocol for system network communications. This will resolve the problems of openness in network communications, the standards in networking equipment, and the reduction in cost for network communication. However, the design of standard Ethernet technology and TCP/IP protocol were intended to handle industrial application environment with high requirements for real-time, reliability, and stability.

Two major issues of the standard Ethernet and TCP/IP:

- Standard Ethernet CSMA/CD bus access mechanism can not resolve the real-time uncertainty caused by network collision;
- The wide applications of TCP/IP protocol calls for virus protection. Viruses transmitted by standard network protocols have brought extra pressure for DCS system stability, reliability and security.

DRTE
Protocol
THE REAL-TIME ETHERNET WITH SAFETY COMMUNICATIONS THAT YOU CAN RELY ON

Under this circumstances, HollySys developed the DRTE protocol based on Ethernet. It fully utilizes the standard and high bandwidth features of the Ethernet, and resolves the issues of safety communication and real-time uncertainty caused by traditional “Ethernet +TCP/IP protocol” mode.

Features

- DRTE protocol can operate in various operating system platform such as Windows 2000, Windows 2003, Windows XP, LINUX, etc...
- Built-in support for network redundancy switching, switch time <1s.
- Maximum network nodes: 255.
- Zero copy technology.
- Provide message receiving and sending interface, based on node numbers and ports, similar to UDP protocol.
- Adapt to 10/100/1000 Mbps standard Ethernet network hardware from different manufacturers.

Values

- Real-time: Certainty real-time Ethernet communication protocol.
- Open: Compatible with TCP/IP (not real-time channel).
- Safe: Preventing the spread of network virus in DCS system.
- Cost: By adopting standard Ethernet hardware, the cost in maintenance, personnel, training and spare parts are reduced.

System Core Hardware – Field Control Station

Field control station, the signal collecting and controlling equipment, is the core hardware of HOLLiAS MACS DCS. Functioning as signal collection, loop regulation, sequence control, and logic interlock, etc, it is the master unit for data collection and process control.

Hardware Structure of Field Control Station

Field control station consists of control racks, controllers, power supply modules, smart I/O modules, terminal modules, communication network, and control cabinets. Controllers and smart I/O modules have built-in real-time operating system and I/O module operating software, as well as complete LED indicators showing their operational status.

Field Control Cabinets

Control racks, controllers, power modules, smart I/O modules, terminal modules, and communication network are all located inside field control cabinet. The cabinets can be installed in the control room or distributed on site.

Hardware & Application Features

FM and SM modules

FM and SM series modules are designed to be reliable, advanced, and easy-to-use. The following are their technical features:

- The physical structure of controller is independent from I/O modules all supporting hot swap features for easy maintenance.
- Main controller adopts high shock-proof and low power consumption CPU working without fans for a longer and safer operational period. (CPU fans in industry field usually last no more than 2 years) The long period power consumption for the entire controller is less than 7.5 watts. All CPU and memories inside the controllers adopt SMT or DIP insertion mode to improve its shock-proof performance.
- Power modules are small, light, and highly efficient, with powerful anti-disturbance, wide input voltage ranges, and load sharing in parallel as redundancy;
- Smart IO modules, built-in micro-controllers, supporting Profibus-DP slave station interface;
- Independent A/D or D/A circuit; low density design, 8 AIO and 16 DIO for each module. AI and AO can both support redundancy.
- Isolation between field and electrical system, partial AIO inter-channel isolation, DI optical-coupling isolation, DO optical-coupling or relay isolation.
- Automatic power-on for controllers and I/O modules with normal working conditions status.

FM and SM series modules have different features in terms of structure and installation to meet the requirements of various industrial applications.

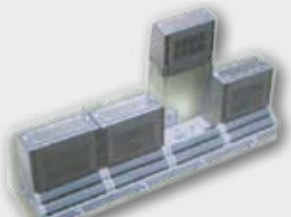
The Features of FM Controller

The controllers and power supply modules have independent physical structures from I/O modules. They adopts centralized installation on a system rack with redundant configuration for better reliability and shock-proof.

The FM Controller installed on a system rack

Distributed smart I/O modules are installed on 35mm standard DIN rails, with anti-protection key on the base (preventing wrong modules insertion), supporting hot swap, and no messy wiring involved.

I/O module can cable out from the base or through the terminal board; modules can be centralized, decentralized, or distributed remotely; The Profibus-DP fieldbus can be extended through repeaters; or by using additional bus controller to support redundancy.



The FM Smart I/O Modules

The Features of SM Controller

The SM Controller

- *Optimized installation structure to adapt to severe environment:* SM series adopt 4U integrated rack structure to install power modules, controllers, and IO modules in one rack. Each module is fastened on the rack through two fastening hooks on both ends. Such installation can better adapt to severe environment in terms of shock-proof.
- *Distributed power modules for better power supply reliability:* Each SM rack has 2 redundant power supply modules adopting load sharing redundancy, limiting power failure impact to one single rack.
- *Redundant Profibus-DP network:* SM racks can be remotely distributed without repeaters and redundancy controllers.
- *Lower power consumption of the IO modules:* The power consumption of IO modules has been reduced to less than 3W, which does not only increase the working environmental temperature of modules, but also improves their reliability.
- *Multiple isolation protections ensuring reliability and safety of the hardware system:* Isolation between channels, between field and system, between racks, and between communication networks. These isolation measures ensure the reliability and safety of hardware system.
- *Terminal wiring on the back of cabinet and function modules on the front of cabinet:* This ensures clean distribution, facilitates system maintenance, and improves safety.
- *Terminal modular design for better protection:* Each terminal module has a cover that can be easily removed without using tools. This protects the terminals and facilitates daily maintenance such as changing relays or fuse.

Hardware Reliability

HOLLiAS MACS DCS features the following reliability technologies which are proven effective in over 3500 projects installation.

Redundancy

- *Controller Redundancy*

  Controllers redundancy are used with one primary and the other standby. It is designed with hardware redundancy, shift and fault self-detect circuit. Two controllers receive network data and make calculation at the same time but only one outputs the calculated results and updates the real-time data. Once the primary controller fails, the standby unit will be shifted to work as the primary without any disturbances.

- *Power Supply Redundancy Modules*

  Power modules are specially designed in redundant configuration, in case one power module fails, the other will take over all the power load.

- *I/O Redundancy*

  AI/AO equipment are configured in redundancy.

- *Network Redundancy*

  Industrial Ethernet interfaces with redundancy are configured for the controller with embedded Profibus-DP master station interface. For example, the Profibus-DP redundancy controller unit, FM1200, is used for network redundancy in terms of MACS-FM series. MACS-SM series also supports network redundancy.

Distribution and Isolation

FM series, mounted in rails, can be centralized, distributed or remotely distributed. Barrier circuit (channel isolation for AI/AO, optical-coupling isolation for DI, optical-coupling isolation or relay isolation for DO) prevents disturbance from the system. Channel isolation is able to eliminate the damage caused by field potential difference.

Easy Maintenance

- *Self-diagnosis*

  With embedded controller, each module is able to have periodic self-diagnosis, including the following:

  - DO channel: read-back, comparison, self-diagnosis.
  - AI channel: adopts special input channel fault-diagnosis technology, diagnoses and checks open-circuit, short-circuit and jump.
  - AO channel: adopts special output channel fault-diagnosis and diagnoses output channel and executor.

- *Status Indicators*

  There are LED indicators in all modules and controllers, including running indicator, error indication and network communication indicator. The running status of all modules is clear. At the operator station, operators can call the system status graphic to monitor the running status of each station or each module.

- *Support hot swap.*

  Controller and all AI, AO, DI, DO support hot swap, which enables easy maintenance in case that any module fails. All input/output signals are connected to terminal module. I/O signal enters I/O module through terminal module. No wiring changes are required when the I/O module needs replacement.

Error Indicators for FM

Hot Swap for FM Modules

Hot Swap for SM Modules

Error Indicators for SM

HOLLiAS MACS System Software

Overview

HOLLiAS MACS provides user-friendly HMI, powerful programming and simulation software that takes care of the configuration of all functions and data storing and processing capability that is able to record important historical data and provide reports.

The power of all these functions lies in the software structure and technology. Client/Server structure is adopted by HOLLiAS MACS DCS operating level to guarantee data coherence, completeness and safety, featuring good flexibility and expandability.

With COM/DCOM, middleware technology and OPC technology, HOLLiAS MACS software system supports and provides OPC interface based on COM/DCOM technology. With standard OPC interface, data communication between instruments of different suppliers becomes easier to maintain and no special interface programming is necessary.

User-friendly HMI

With HOLLiAS MACS HMI, the operators are able to get the whole process information, browse the flow chart, quickly identify various events, and input the required control parameters to ensure safe operation of the various equipment. In addition, with corresponding authorization, operators, maintenance engineers, and managers are able to track the process, modify process parameters, and obtain reports.

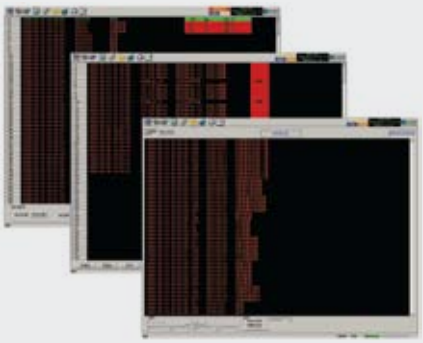
Engineering Flow Chart

- All the measuring points monitored by the control system can be displayed using graphics icons or symbols including digit, current value, dimension, value ranges with upper and lower limits.
- Support multi-level display structure, display levels can be designed according to engineering procedure and running sequence.
- The graphics can be called in various modes such as menu mode, movable window display, automatic pop-up display, hot point call and keyboard call.

Engineering Flow Chart

Alarms

HOLLiAS MACS alarm function helps and reminds the operator to solve sudden in case of abnormal status or equipment failure status during the production process. Alarms are categorized into process alarm, equipment alarm and SOE signal alarm.



Alarms

Reports

HOLLiAS MACS software provides integrated report system, which can print all the measuring points in the database. The measuring points in the report can be printed in formats defined by users. Automatic printing or manual printing is optional.

Logs

HOLLiAS MACS software provides logging function which can automatically records, stores, and checks all the sudden events in sequence and provides detailed evidence for managers to analyze the events.

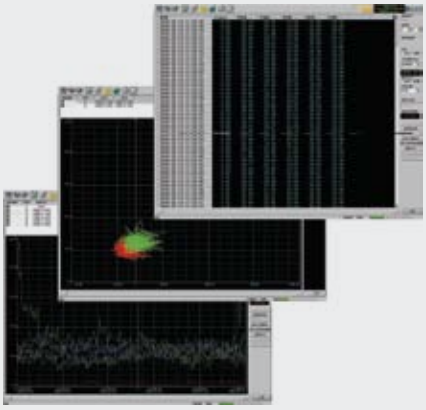
Logs can be classified into daily log, equipment log, operation log, SOE log and simplified log. Logs can be displayed in track mode and historical mode. In track mode, the system will automatically display the most recent information. In historical mode, historical event can be displayed. All event

Logs

information, operation parameter setting events, alarm monitor and timing information are grouped into different logs.

Historical Trend

HOLLiAS MACS software records all information of the measuring points in a database and displayed either in the form of data or charts, featuring with flexible modified time axis ranges and parameter axis ranges. Trend curve provides monitoring platform for plant managers or administrator to know if the production process is safe and effective.



Historical Trends

Various trend can be displayed such as general trend, digital trend, XY trend and comparative trend. General trend deals with both analog and digital trend information. Digital trend takes care of digital trend information and functions as modification query. XY trend handles trend information composed by two related parameters as XY axis, mainly used to provide safe information. Comparative trend reflects the difference between actual and planned processes by comparing the preset parameter curve and actual parameter, mainly used for line running supervision.

General trend, digital trend and XY trend can be displayed in track mode and historical mode. General trend can be displayed in curve and data and the other two can only be displayed in curve.

Maximum of 8 measuring points trend can be displayed for analog and digital trend. Maximum of 4 curves can be displayed for XY trend display. And the curve display range scope is real-time modified according to the curve fluctuation displayed on the screen to easily identify the change of curve. The operator is allowed to select or shield this function.

Powerful Configuration Software

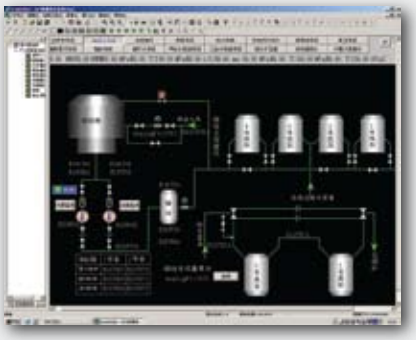
HOLLiAS MACS provides user-friendly, powerful programming, and simulation software to configure all system functions and collectively control and manage the whole project execution. The software consists of system equipment, database, control calculation, graphic, report, off-line simulation, and on-line management. It provides an integrated platform to design your graphical Interface and control strategy.

Integrated Database

Integrated database stores all configuration data and settings. Database configuration is to define and edit the measuring point information, including actual physical measuring points and Mid-variables.

Large Graphical Libraries

HOLLiAS MACS graphical layout and design software enables users to design a direct and clear operational user interface. With the help of the large and practical graphical libraries, users are able to easily draw complex and beautiful graphic such as animation, data, curves bar charts and real-time display of all the devices and instruments or display complicated tables for any data type. HOLLiAS MACS software also provides a dynamic icons to indicate the running status of equipment and parameter value as real-time dynamic points. Users are also allowed to have personal graphic library and store frequently used graphic in the library as icons for repeated usage.



Large Graphical Libraries

Powerful Control Strategy Generation Tool

Consist of control calculation editor and simulation debugger, the control strategy generation tool allows you to write control algorithms through programming, downloading, and simulating.

- *Control Strategy Programming*

HOLLiAS MACS control strategy generation tool provides rich function block calculation library, like

IEC operator, type transfer function, timer, trigger, counter function, emergency events function, PID control, fuzzy control and sequence control. Users are also allowed to add self-defined functions. Typical industrial control algorithms, like batch control, PID loop, complex loop, logic loop, hybrid loop, advanced control calculation and special recipe control can be fulfilled by using library function.

Rich Function Block Libraries

- *User Programmable Functions*

HOLLiAS MACS control strategy generation system allows users to have further development on it, providing self-defined functions and function blocks. Users are able to program complex control modules with six programming languages and embed them to the system.
The control strategy configuration interface adopts an explorer-like window with tree-structures to display the control solutions and set basic attributes, like solution name, used language, calculation cycle, calculation switch and sequence.

- *On-line Download without Disturbance*

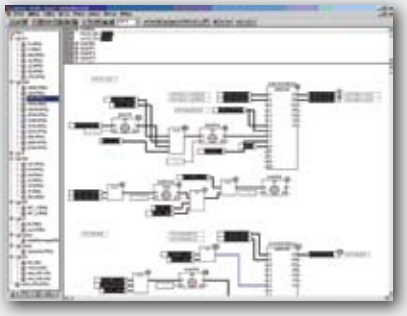
All databases in HOLLiAS MACS system can be downloaded to the controller. The system provides specific reminding and warning information during the download. Modified incremental files can also be downloaded to the controller without disturbing system running.

- *Convenient Off-Line Simulation Environment*

HOLLiAS MACS provides off-line simulation environment. Users are allowed to debug the control algorithms configuration in non-field environments like at home or offices. Under the simulation mode, program can run independently from the controller. Breakpoint, monitor variable, single-step execution, single-loop execution, jump execution, call execution, call stack check, flow control, value modification and forced output can be set during simulation.

- *On-line Modification*

The system supports on-line modification. Users can login the controller to modify auxiliary information like range without affecting the running system and process. Meanwhile, users are also allowed to force output and input variables and cancel the forcing. Breakpoint setting, monitoring variable, single-step execution, single-loop execution, jump execution, call execution, call stack check and flow control can be applied.



Online Modification

Supports Six Industrial Standard Programming Languages

HOLLiAS MACS adopts IEC61131-3 configuration tools and provides six standard industrial programming languages, FBD, LD, ST, IL, SFC and CFC for different industrial control applications.

FBD-Function Block Diagram

FBD, a Graphical function block language, enabling calculation and control. FBD consists of basic function blocks, links and input/output terminals and prescribes the call sequence of all function blocks and parameters required by corresponding module calculation.

LD-Ladder Diagram

LD is continuous executing language used for basic logic control, consisting of contacts (normal open/close, positive slope triggering, negative slope triggering, reversion), coil (output, monostability, lock, unlock, jump), connection, timer and counter. LD is good at quick discrete logic control, including motor control, interlock, random check and simple sequence control.

ST-Structural Text

ST is used for complex control applications composed of some key characters and instructions, like symbols (key characters, operators, modifiers, and operands), statements (expressions, control statements), functions and function blocks. Control solutions can be programmed taking character line as the unit.

IL-Instruction List

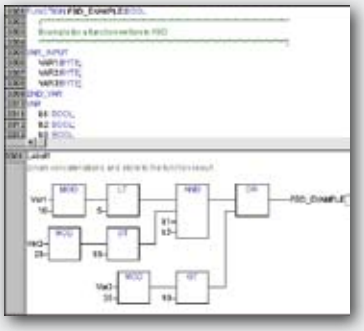
IL is the most fundamental computer programming language. It can be simply operated with abundant content.

SFC-Sequence Function Chart

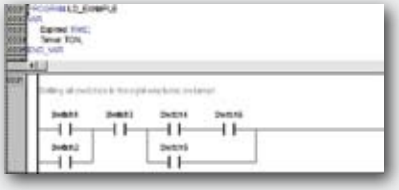
SFC is used as the connection between continuous control or logic control and input/output monitor to describe and control the sequence operations of the process events, applying to events with plenty of status controls. SFC consists of a series of steps and transitions, each step including a group of actions affecting the process. SFC supports concurrent sequence and diversified qualified characters. Each action can be fulfilled by any of the above four languages.

CFC-Continuous Function Chart

CFC is similar with FBD but there is no node in CFC.

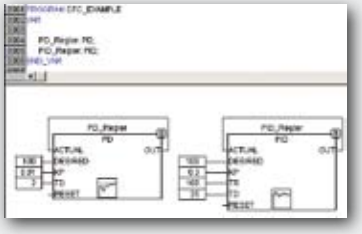


FBD- Function Block Diagram

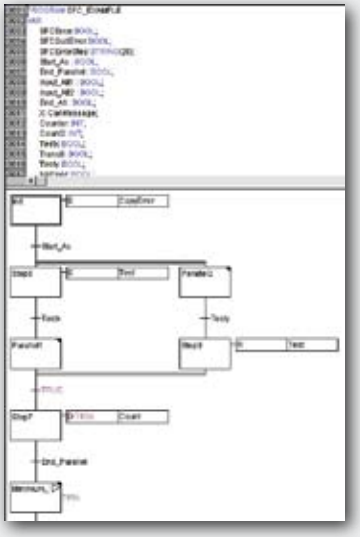


LD- Ladder Diagram

ST-Structured Text



CFC-Continuous Function Chart



SFC-Sequence Function Chart

IL-Instruction List

LIST OF SM SERIES MODULES

TYPE		PRODUCT CODE	PRODUCT NAME	SPECIFICATION
MODULE RACK		SM120	10 slots Module Rack for controller	2x power supply + 6x I/O + 2x controller modules
		SM121	10 slot Module Rack for I/Os	2x power supply + 8x I/O modules
		SM130	14 slots Module Rack for controller	2x power supply + 10x I/O + 2x controller modules
		SM131	14 slot Module Rack for I/Os	2x power supply + 12x I/O modules
	MAIN DPU CONTROLLER	SM201-Smartpro	Main DPU Controller with 100Mhz processor	Embedded x86 processor, 100MHz
		SM201-MACS-V	Main DPU Controller with 100Mhz processor	Embedded x86 processor, 100MHz
		SM203-MACS-V	Main DPU Controller with 400Mhz processor	Embedded x86 processor, 400MHz
EXPANSION MODULES 	ANALOG INPUTS	SM410	8 channels voltage AI module	0 ~ 5.5V / 0 ~ 11V
		SM413	8 channels (channel isolation) voltage AI module	
		SM412	8 channels current AI module with HART support	
		SM481	8 channels current AI module	0 ~ 11mA / 0 ~ 22mA
		SM432	8 channels RTD AI module	Cu50, Pt100, constant current
		SM472	8 channels thermocouple AI module	± 80mV
	ANALOG OUTPUTS	SM510	8 channels current AO module	4 ~ 20mA
		SM511	8 isolated channels current AO module	4 ~ 20mA / o ~ 20mA
		SM512	8 channels current AO module with HART support	
		SM520	6 channels current AO redundancy module	4 ~ 20mA
		SM522	6 channels current AO redundancy module with HART support	
	DIGITAL INPUTS	SM610	16 points DI module, 24VDC	24VDC
		SM618	16 points DI module, 48VDC	48VDC
		SM611	16 points DI module, 24VDC, SOE	24VDC, Sequence of Events
		SM619	16 points DI, 48VDC, SOE	48VDC, Sequence of Events
		SM620	8 channels pulse input module - 0 ~ 10KHz	0 ~ 10KHz
	DIGITAL OUTPUTS	SM711	16 points transistor type DO module	50mA, 24VDC
	COMMUNICATIONS	SM020	MODBUS communication module	
	DEH Steam Turbine Generator Application Module	SM461	DEH Steam Turbine Generator Servo Unit Module	
		SM3461	DEH Steam Turbine Generator - Servo Unit I/O Terminal Block	Terminal I/O Block
		SM351	DEH Steam Turbine Generator - Primary Frequency Terminal Module	
		SM632	DEH Steam Turbine Generator - Speed Measurement,Drag Speeding, & Overspeed Protection Module	For use in general industrial application
		SM633	DEH Steam Turbine Generator - Speed Measurement & Overspeed Protection Module	For use in Electric Power Plant Application
	POWER SUPPLY MODULES	SM900	DC Power supply module with Dual isolated channel 24VDC / 5VDC	220VAC Input; 2A@24VDC or 7A@5VDC output, 2 isolated channel output
		SM902A	DC Power supply module - 24VDC converted to 5.1VDC	24VDC converted to 5.1VDC
		SM910	DC Power supply module - 24VDC	
		SM911	DC Power supply module - 24VDC (240W)	240W, Max
		SM920	DC Power supply module - 48VDC (120W)	120W, Max
		SM933	AC Power supply distribution module - 110V ~ 240VAC	110V ~ 240VAC
		SM934	AC Power supply module with dual channel, auto switch, 110V ~ 240VAC	110V ~ 240VAC
		SM940	DC Power supply distribution module - 24VDC / 48VDC	24VDC / 48VDC
	MISCELLANEOUS / SPECIAL MODULES	SM632	DEH Over-Speed protection module	Industrial Digital Electro Hydraulic (DEH) - steam turbine's speed measurement, drag speeding, and protection module
		SM633	DEH Over-Speed protection power generator module	Digital Electro Hydraulic (DEH) generator - steam turbine, speed measurement, and protection module
	TERMINAL I/O BLOCKS	SM3310	Standard double row terminal block	
		SM3330	8 channel Current AI redundancy terminal block	
		SM3340	8 channel Voltage AI / Current AO redundancy terminal block	
		SM3412	8 channel Current (limited protection) AI redundancy terminal block	
		SM3432	8 channel RTD AI terminal block	
		SM3470	8 channel Thermocouple AI terminal block	
		SM3471	7 channel Thermocouple AI terminal block with cold-end compensation	
		SM3480	8 channel Current AI terminal block	
		SM3510	8 isolated channel Current AO terminal block	
		SM3610	16 channel DI terminal block	
		SM3611	16 channel DI terminal block, 110V~240VAC	110V~240VAC
		SM3612	16 channel Power distribution terminal block - 48VDC	48VDC
		SM3613	16 channel Pulse distribution terminal block - SOE timing	SOE timing
		SM3614	16 channel 24VDC Isolated Relay DI terminal block	24VDC
		SM3710	16 channel AC relay DO terminal block - 110V~240VAC, 1A	110V~240VAC, 1A
		SM3711	16 channel DC relay DO terminal block - 110VDC	110VDC
		SM3712	16 channel AC/DC solid-state relay DO terminal block	
		SM3713	16 channel AC relay DO terminal block - 110V~240VAC, 4A	110V~240VAC, 4A
		SM3714	16 channel DC relay DO terminal module - 30VDC	30VDC

LIST OF FM SERIES MODULES

TYPE		PRODUCT CODE	PRODUCT NAME	SPECIFICATION
RACK		FM301	8 slots controller rack	6 power supply + 2 controller modules
	MAIN CONTROLLER	FM801 - Smartpro FM801 - MACS-V	Main controller with 100MHz processor	Embedded x86 processor, 100MHz
		FM803-Smartpro FM803 - MACS-V	Main controller with 400MHz processor	Embedded x86 processor, 400MHz
	ANALOG INPUTS	FM143E	8 isolated channels RTD AI module	0 ~ 400 Ω
		FM147E	8 isolated channels thermocouple AI module	J,K,T,N,E,R,S,B thermocouple type and mV type
		FM148A	8 channels voltage / current AI module	0 ~ 5V / 0 ~ 10V, 0 ~ 20mA, 0 ~ 10mA, 4 ~ 20mA
		FM148C	8 channels voltage / current AI module	0 ~ 5V / 0 ~ 10V, 0 ~ 20mA, 0 ~ 10mA or0 ~ 5.5V, 0~11V, 0 ~ 22mA, 0 ~ 11mA
		FM148E	8 isolated channels voltage / current AI module	0 ~ 5V / 0 ~ 10V, 0(4) ~ 20mA
		FM148R	8 channels voltage / current AI redundancy module	0 ~ 5V, 0(4) ~ 20mA
	ANALOG OUTPUTS	FM151A	8 channels current AO module	4 ~ 20mA
		FM152A	6-channel current AO redundancy module	4 ~ 20mA
	DIGITAL INPUTS	FM161D	16 points DI module, 24VDC	24VDC
		FM161D-48	16 points DI module, 48VDC	48VDC
		FM161D-48- SOE	16 points DI module, SOE, 48VDC	48VDC, Sequence of Events
		FM161D-SOE	16 points DI module, SOE, 24VDC	24VDC, Sequence of Events
		FM161E-48-SOE	15 points DI module, SOE, 48VDC	Emergency, hard-timing/response time SOE, 48VDC
		FM162	8 channels pulse input module	0 ~ 10 KHz
	DIGITAL OUTPUTS	FM171	16 points relay type DO module	Passive, Normally Open
		FM171B	16 points transistor type DO module	Optical coupling
	COMMUNICATION MODULES	FM1200	Profibus-DP controller redundancy module	
		FM1201	Profibus-DP repeater module	
		FM1202	Profibus-DP fiber optical transducer module	
		FM192A-TR	Profibus-DP Terminal Adapter	
		FM1302	Profibus-DP controller base module	
		FM1303	Profibus-DP repeater base module	
	DEH Application	FM163D	DEH Turbine Generator - Speed Measurement & Overspeed Protection Module	Industrial Application (smaller unit)
		FM163E	DEH Turbine Generator - Speed Measurement & Overspeed Protection Module	Electric Power Plant Application (larger unit)
		FM165	DEH Steam Turbine Generator - Primary Frequency Function Module	
		FM131A-DEH	DEH adapter module	
		FM1460	DEH Turbine Generator Servo Unit - Terminal Module	
		FM146A	DEH Turbine Generator Servo Unit - Function Module	
	MISCELLANEOUS / SPECIAL MODULES	FM185	Remotely Temperature Data Acquisition Module	
		FM192B-CC	Thermocouple cold-end compensation module	
		FM197	16 channel Time-Sync Hub Function Module	
		FB1431	Cu50 Installation Terminal Board	
		FB149	16 channel Level Detection DI Terminal Board	
	POWER SUPPLY MODULES	FM910	Power supply module, 24VDC, 6A	24V ±10%, 180W@Max
		FM920	Power supply module, 48VDC, 2.3A	48V ±10%, 150W@Max
		FM931	Power supply distribution module, 24V / 48VDC	24V ±10% / 48V ±10%
	TERMINAL MODULES / BASE MODULES	FM1310	Terminal Base Module (Phoenix Connector)	
		FM131A	Standard Terminal Base Module	40 wiring terminal
		FM131-C	Terminal Base Module (box-head connector)	Flat cable type connection w/ box-head connector
		FM131-E	Terminal Base Module (37-pin D-type connector)	Round cable connection w/ D-type connector
		FM132	AO redundancy terminal module	Use with FM152A
		FM133	Current AI redundancy terminal module	Use with FM148R
		FM134	Voltage AI redundancy terminal module	Use with FM148R
	TERMINAL MODULES EXPANSION	FM136-DCR	16 channel 220V/110V DC, redundancy DI Terminal Module	
		FM-138-ACR-A	16 channel AC relay redundancy DO terminal module	dual-link type terminal, IDEC Relay
		FM-138-ACR-C	16 channel AC relay redundancy DO terminal module	dual-link type terminal, Matsushita Relay
		FM-138-DCR	16 channel DC relay redundancy DO terminal module	dual-link type terminal
		FM138-SSRR	16 channel AC/DC solid-state relay DO redundancy terminal module	dual-link type terminal

Our Achievements

HollySys is one of the leading automation control systems providers for various industries. Our automation control systems have been successfully applied in many key infrastructures such as large thermal power plant, nuclear power plant, etc, and have played an important role in many projects including China's railway speed upgrade and urban mass transit. By the end of 2007, we have served more than 3,000 customers and undertaken over 6,000 projects. All these achievements prove that HollySys' products and technologies have great extensiveness, reliability and many other advantages.

Power Industries

The power industries has become an important factor of HollySys business. Started since 1995, HollySys have access to the power industries providing solutions from the furnace and turbine control up to the information management system. We have completed over 1,200 power plant projects covering each field of the production process from 6 megawatt up to 600 megawatt power plant. We provides a complete solution from the control layer up to the management layer of a DCS. It fulfilled the automation and information needs of the various processes from the raw material transportation and processing, boiler combustion (pulverized coal/Circulating Fluid Bed Boiler), steam turbine (steam turbine and heat recovery monitor and control), system monitoring and control of the generator and plant electrical system, waste and exhaust treatment, as well as the management system of the production processes.

Environment Protection & Waste Industries

We have completed projects for the environmental infrastructure such as urban sewage centralized treatment, smoke dedust and desulphurization, and garbage incineration & power generation, fullfilling the complete automation process from production to information monitoring and supervision.

HollySys control system products (DCS and PLC) have been operating in over 100 sites in environmental protection industry. Some of them are water treatment projects with PLC products. HollySys has also mastered some advanced control technologies for key processes, such as garbage incineration technology and turbine sliding pressure operation technology, with applications in over 10 projects. HollySys has completed over 40 smoke dedust and desulphurization projects utilizing DCS technology.

Machinery and Manufacturing Industries

HollySys's LM Micro Series PLC, characterized by numerous good features such as back-up protection, off-line simulation, abundant instructions, and reliable control, is labeled as a high-performance and quality PLC product offering good economical profit for our customers.

The LM Micro Series PLC is widely applied in all industrial and equipment like printing machine, building material machine, packing machine, plastic machine, etc...

Oil and Gas, Petrochemical, and Chemical

HollySys has successfully completed over 1000 projects in the industries field for oil & gas, petrochemical, and chemical. HollySys product has been chosen by BASF Chemical Co., Ltd., a German company among the world top 500 enterprise, and has become the qualified supplier for China's Huanqiu Contracting & Engineering Corp., the largest chemical design institute in China.

Metals, Mining, Cement, & Glass Industries

Building material and metallurgical industry is another important fields. We have completed over 100 engineering projects providing management and control solution from production control level to management level.

HollySys applications in building material industry include cement, glass fiber, and glass. HollySys has completed over 80 DCS systems and testing projects for cement production lines, and over 20 glass/glass fiber projects. HollySys products are successfully put into operation for 1000t/d, 2500t/d, 4000t/d and 5000t/d clinker production lines of cement factories in China.

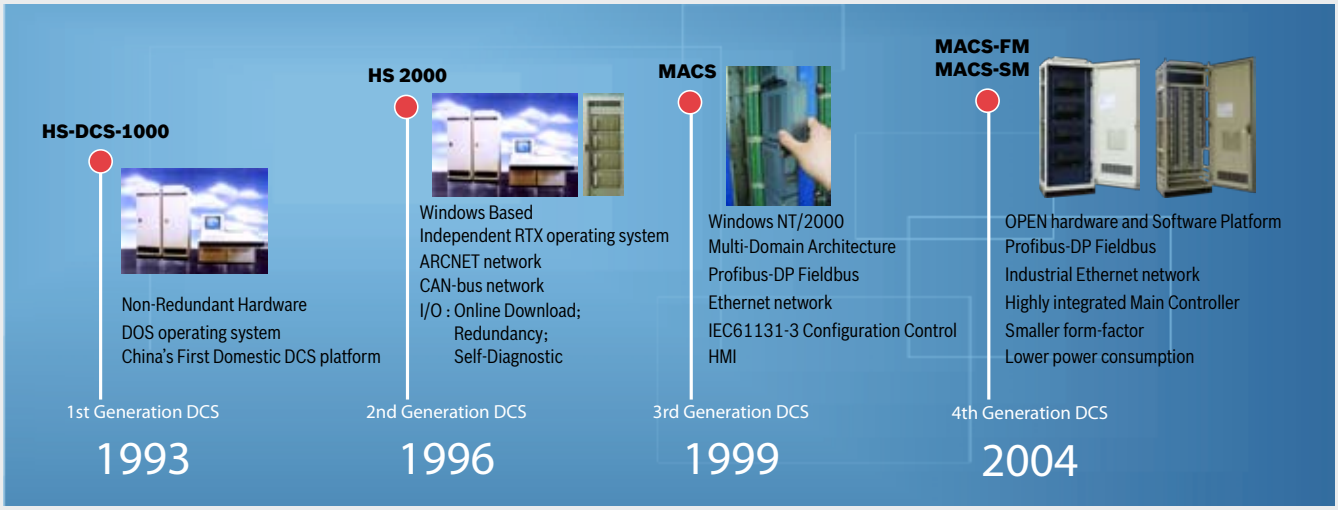
Pulp & Paper Industries

HollySys has hundreds of successful DCS applications in pulp and paper industry. Our solution covers every unit of the whole plant, including raw material preparation, pulp making, chemicals recovery, dry end of paper machine, QCS, conveying system, steam boiler, plant power transmission & distribution, as well as water treatment.

Metro / Urban Mass Transit

HollySys have implemented the China's first project of integrated supervision and control system to the number 13 line of Beijing Urban subway in 2000. HollySys has successfully integrated the MACS-SCADA Integrated Supervision and Control System and implemented the projects for the integrated supervision and control system for roughly ten major subways in China, including Beijing, Shenzhen and Guangzhou.

Our DCS Evolution



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Automation and Control

For 15 years, the HollySys name has stood for quality and reliability. HollySys proudly offers a wide range of automation and control products from PLCs to DCS to help you find the solution for any industrial automation and process control application. We are the global supplier of choice for innovative technology backed by the highest level of service and support. When you need products and solutions you can rely on, choose HollySys.

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