Integrated Production Control System

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Sets the Standards for Tomorrow’s Industry

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Sets the Standards for Tomorrow’s Industry
Wide Applicability with Maximum Flexibility
A large production support system requires an optimally-balanced configuration of sensors, operation equipment and control computers installed in the field. With its strong track record in implementing all types of plant automation, Yokogawa has the know-how and expertise required to configure any production support system.

CENTUM CS, the core of Yokogawa’s integrated production control systems, controls the management of operations, production, facilities, safety, and plant environment. It can completely execute plant operations, management and control. CENTUM CS is perfectly suited to plants in any field - refining, chemical or petrochemical products, iron and steel, nonmetal and ceramic, pulp and paper, food, pharmaceutical products, electric power, gas and oil, water and wastewater, textile, or any state-of-the-art factory.

Flexibility - Four Basic Concepts

**Innovative integration**
CENTUM CS offers innovative integration to cope with various plant automation requirements - for example, integration of instrument, electric, and computer systems; integration of process and factory automation systems; integration of control-room interfaces; integration of locally as well as globally distributed systems; and integration of CIM (computer integrated manufacturing). CENTUM CS comprehensively offers optimal, innovative solutions for your integration requirements.

**Unified architecture**
Standardized interfaces with a wide variety of subsystems and software packages, simplified system operation, and a unified engineering environment are essential in achieving a truly open system environment. CENTUM CS meets these requirements readily, while also providing maximum flexibility for future expansion, with consistent reliability and functionality ensuring smooth system advancement well into the future.

**Increased engineering efficiency**
In order to shorten the lead time between product development and production, engineering methods must be continuously refined. CENTUM CS has a wealth of field-proven application packages to meet this requirement. It also has exceptional engineering methods which have been standardized in the open environment.

**Life-cycle optimization**
CENTUM CS is designed to optimize all costs involved in the setup, engineering, startup, maintenance, and safeguarding of your system. Moreover, your existing software, instrumentation and information system can all be effectively integrated in the new system. This helps optimize total systematization costs throughout the lifetime of the system.
The CENTUM system was introduced in 1975 as the world's first distributed control system, integrating control, computation and communication technologies. The system has never ceased developing since then. Unit operator stations, redundant coprocessor systems (CENTUM); functional human-interfaces, voice output, sequence control stations, user-oriented operation systems (CENTUM-V); functional human-interfaces, voice output, sequence control stations, user-oriented operation systems (CENTUM-V); and many other achievements highlight the system's development. Every advancement of the CENTUM system has always marked the start of a new trend in the field. The system has been enhanced over time, but it has always maintained compatibility with CENTUM system users' existing resources. This ensures maximum utilization of the user's existing hardware, software, engineering know-how and data. Yokogawa's vision of maintaining continuity throughout the growth of a system is certainly reflected in the CENTUM CS system.

The CENTUM CS system features integrated operation, open-network architecture, control stations with RISC CPU (the first in the industry), and other advanced functions. The system permits overall improvement or renovation of your existing system. It also promises a smooth transition to future system advancement, supporting all sorts of existing resources. It is a worthwhile investment that brings excellent results in operation and maintenance throughout the life cycle of the system. The CENTUM CS system reflects the philosophy of Yokogawa, a leading company in the field of distributed control systems.

Yokogawa's Capability and Years of Expertise Reflected in Past and Present CENTUM Systems

In 1975, the CENTUM system was introduced as the world's first distributed control system, integrating control, computation and communication technologies. The system has never ceased developing since then. Unit operator stations, redundant coprocessor systems (CENTUM); functional human-interfaces, voice output, sequence control stations, user-oriented operation systems (CENTUM-V); integrated engineering functions, touch-sensitive control panels, multiple windows, integration (CENTUM-XL); and many other achievements highlight the system's development. Every advancement of the CENTUM system has always marked the start of a new trend in the field. The system has been enhanced over time, but it has always maintained compatibility with CENTUM system users' existing resources. This ensures maximum utilization of the user's existing hardware, software, engineering know-how and data. Yokogawa's vision of maintaining continuity throughout the growth of a system is certainly reflected in the CENTUM CS system.

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ICS (Information and Command Station)
The ICS is a high-performance human-interface used for control and monitoring of plant operations. It does this by gathering all of the required information - process variables, setpoints, measured values, control parameters, alarm status, etc. It can be equipped with engineering and supervisory computer communication functions, offering an open environment allowing expansion or upgrading, as required.

Console ICS
A standard ICS, renowned for its high performance and reliability.

Desktop ICS
A space-saving ICS, equipped with all of the functions of the console-type station.

PICS (PC-based ICS)
A new-generation ICS, utilizing a general-purpose computer that meets the needs of today and tomorrow.

HICS (Workstation-based ICS)
A high-performance ICS, utilizing a general-purpose workstation.

EWS (Engineering Workstation)
A workstation used for engineering operations.

FCS (Field Control Station)
The FCS is the heart of CENTUM CS advanced control functions. It is high reliability and supports both remote I/O functions and Fieldbus.

ACS (Advanced Control Station)
This station executes supervisory control of multiple field control stations (FCSs) and has advanced control algorithms for the execution of advanced control functions.

Node
This is a remote I/O device providing communications for field devices with FCSs via fieldbus.

Communication Node
This is a remote I/O device to handle large amounts of data transferred between subsystems and FCSs.

ACG (Communication Gateway Unit)
This unit connects an EWS or supervisory computer with the system-control V net bus.

ABC (Bus Converter)
This device provides connections between system-buses, integrating existing Yokogawa (CENTUM-V, CENTUM-XL) distributed control systems or other CENTUM CS systems.

V net
This real-time system-control bus connecting all CENTUM CS stations together, providing quick and reliable response.

RIO bus
This is a communications bus between remote I/O devices and an FCS.

Ethernet
Ethernet is an information LAN that connects higher-level systems with ICSs, permitting the communication of data files and trend files.

E net
This is an information LAN within a system interconnecting multiple ICSs or connecting EWSs.

Fieldbus
This bus, which uses Foundation Fieldbus standards, permits digital communications for field equipment capable of two-way communication.
A Monitoring System for Globally Integrated Plant Operations

Plants and factories located in different parts of the world can operate efficiently only if they are linked together in a way that permits the integrated application of all necessary operating information.

The CENTUM CS offers a communication function that uses digital public networks which easily support an integrated network of plants and factories - regardless of location or time zone.

CENTUM CS Integrates Plants Around the World Into One Network

Fieldbus Technology Opens a New Age of Digital Instrumentation

Cutting-edge Performance of Fieldbus

CENTUM CS has been one of the first to use Fieldbus, this represents a revolution in digital communications, meeting Foundation Fieldbus standards. The Fieldbus permits two-way communications for field equipment, thus enabling the networking of field information.

Fieldbus also ensures the high-speed transmission of large amounts of data, as well as interactive operability between field devices. As a result, it can overcome the shortcomings of conventional communications methods. Consequently Fieldbus contributes greatly to the optimum configuration of integrated systems.

Yokogawa has played a leading role supporting international standards for the Fieldbus, recognizing the importance of establishing Fieldbus technology in this age of digital instrumentation.

Advantages of Fieldbus

Fewer cables: A number of field devices can be connected to a single cable with multiple-drop connection, making it possible to transmit multiple data values over one cable using a multi-sensing function.

Improved transmission accuracy: Digital signals largely reduce data-transmission errors.

Advanced communication capability: All types of data, other than process or measured variables, can be transmitted bi-directionally at high speeds. This means the installation of fewer cables.

Secured interactive operability and optimum system configuration: Interactive operability can be provided, regardless of field equipment manufacturer. This expands equipment availability, allowing optimum choices for your own type of system configuration.

Distributed control: Data exchange and control can be executed between field devices in the field, reducing the load on the host computer.

Integrated systems: Instrumentation, electrical, process, factory automation, building automation, office automation, and other systems can be freely integrated to ensure concentrated control and operation.

Easier failure diagnosis: Minute fluctuations in process variables can be precisely measured and analyzed in time-series order, ensuring efficient diagnosis of failures.
A Full Lineup For Your Operational Requirements

Easy-to-use Operator Stations with Powerful Functions
The Information Command Station (ICS) is an operator-friendly interface to take command of plant operations and monitoring. This powerful station supports the addition of graphic, database, and user C language functions. It also has an engineering function permitting generation and maintenance of CENTUM CS functions, and a function for communicating with supervisory computers.

Multi-platform for Versatile Setup and Application
The ICS has multi-platform capability, allowing a variety of platforms to establish the most comfortable work environment suited for your needs. The console ICS supports multiple setup. The desktop-type offers space-saving compactness. The PC-based PICS features quick and easy application, while the HICS converts your general-purpose workstation into a full-fledged ICS.

Multi-lingual conformity provided
Tag comments, operator guide and help messages, and other information displayed on the ICS CRT are available in the following languages:
- English
- Chinese, simplified
- Chinese, traditional
- Danish/Norwegian
- French
- German
- Italian
- Korean
- Portuguese
- Russian
- Spanish
- Swedish/Finnish

Human-interface Functions - User-friendly Operations
Performance-proven operation panels and windows are used to control powerful functions simply. Touch panel control (console unit) and mouse operations freely permit window displays. Motif, an industry-standard Graphical User Interface (GUI), enhances the engineering function with standardized display and operation. Display and operation procedures have been standardized.

Easy-to-operate Keyboard
The operational keyboard for any type of ICS (desktop, console, PC-based and workstation-based ICS) features functional layout and one-touch key operations. All flat-top keyboards are dust- and water-resistant.

Fast, Mouse-only Operation
An innovation in keyboard-less operation. All “keys” are displayed in the system message section (PICS and HICS), to permit quick and simple operations using only the mouse.

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Multi-functional, Easy-to-read Panels Ensure Efficient Operation

The ICS displays a number of operation and monitoring panels, which can be navigated via touch screen (console ICS), mouse, trackball or keyboard.

The use of windows on these multi-function panels expands their ability to implement multimedia, computer-windowing, message invoking, and instrument-face plate viewing functions. Graphic calculations and user-application data processing are likewise supported. All panels and windows offer easy-to-read, complete information, so ensure efficient control operation.

Multi-window Function

Necessary information can be accessed without switching panels, enabling quick control and monitoring. Up to ten windows can be opened on one panel.

Half-size Panel Function

The operation panel displays information at half size (one-quarter in area), permitting one CRT to display four times the volume of information that conventional CRT units could. This greatly extends operation and monitoring scope, while reducing the burden on the operator.

Security Function

Operator log-in and log-out can be restricted for each ICS, and allows for designation of what each operator can perform at the logged-in ICS. The operator’s identification and actions on the system are recorded, offering a full audit trail and strict security for every ICS in operation.

Two-step Action

The ICS takes advantage of the two-step action principle, which is widely employed in electrical and other control fields. Two-step action enables efficient on/off switch control of electric motors, pumps, compressors, conveyors and other devices, and control of the operation of three-position controlled equipment. Just select the equipment’s motor or switch icon on the graphics panel - this lets you control its operation, as indicated by the color of the icon.

Oversized Graphic Panels

Graphics panels can be displayed 4- or 1.5-times larger in area. They can also be scrolled, to select any section for quick viewing.

Computer-windowing Function

The supervisory computer’s display can be shown in a window on the ICS operation panel.

Interaction with User-programs

User-programs can be installed and run interactively with the operation panel, to provide an advanced operation and monitoring environment. This permits the calculation and processing of displayed data, the retrieval, processing and displaying of filled data, plus more.

Humanly-engineered for Smooth, Intuitive Operation

Operation Panels - The Center of Overall Plant Operations

Graphics Panel

The flow of plant processing can be graphically presented, along with data, graphs, modifiers, and other displays. A dynamic display function is available to create elaborate visual panels for operation and monitoring.

Overview Panel

Up to 32 display blocks can be assigned to individual plant equipment units, making it easy to monitor equipment status and overall plant operation. You can easily spot status changes and alarms, since the display blocks change color (red, yellow or green) or flash when they occur. The display blocks can be developed quickly into related panels indicating required actions.

Tuning Panel

Information on each instrument's status can be displayed in detail. The information - parameters, the instrument faceplate, and tuning trend graph - is used to modify setpoints and other parameters.

Control Group Panel

The status of up to eight function blocks can be displayed using instrument faceplates, permitting control and monitoring of their setpoints, manipulated outputs, operation mode, and so on.

Alarm Summary Panel

Process alarms and annunciator messages originating within an operation group of ICSs can be displayed in the order of occurrence. Other important alarm messages can also be displayed selectively.

Trend Group Panel

This panel lets you visually analyze data trends by recording and displaying tag-data changes in time-series order. The tag-data changes from other ICSs can also be displayed via the network.

Operator Guide Message Panel

Pre-installed guidance messages can be displayed when requested by HSCs.
Alarm Function Ensures Rapid Response

Process Alarms
Whenever a process alarm is triggered, the ICS informs the operator in a number of ways: an alarm mark in the system-message section of the display appears; an electronic buzzer sounds; a voice message is given; and the key lamp blinks. The operator then opens the alarm summary panel, overview panel or alarm window to easily obtain details on the cause of the alarm.

Hierarchical Alarms
Alarms are classified into five levels according to seriousness: high-priority, medium priority, low priority, logging, or reference. Lower-level alarms are suppressed when higher-level alarms are in effect, to allow prompt attention to urgent alarms.

Auto-repeating Alarms
If a high-priority alarm has not been processed properly and status has not returned to normal, the alarm is repeated automatically, following a default time cycle.

Operation Groups
Multiple ICSs can be assigned to a specific plant as an operation group. This arrangement shuts off alarms and messages from outside the group, avoiding unnecessary confusion.

Extensive Functions Re-enforcing Plant Operations

Operation Status Panels
The following panels display the current plant control status:
- Control drawing status panel
- Logic chart status panel
- Sequence table status panel
- SFC status panel
- SEBOL status panel

Multimedia-supporting Capability
Industrial Television (ITV) cameras, large screens, voice output, external I/Os and other commercially available interfaces can be integrated with the CENTUM CS ICS. This means you can build a state-of-the-art multimedia system for rational plant operation and monitoring.

ICS Panels Displayed on a Large Screen
The ICS’s high-resolution displays can be projected on a large external screen, allowing other operators to view the display and share the information easily.

Connections to ITV Cameras for Direct Surveillance
ITV cameras can be panned, tilted, or zoomed, and are extremely useful in monitoring plant operations, once displayed on the window. Real-time, moving views of the plant can be shown on the ICS screen - there is no need for a special monitor.
Management Information Function (MIF)
The MIF is an ICS data processing package. Process data from FCSs and historical data at the ICS can be converted into spreadsheets and charts for reference.

Long-term Trending Function
Long-term trend data stored at the ICS can be presented in chart form using the trend window, which shows long-term fluctuation trends and interactive parametric relations in plant operations. Three chart formats are available:
- **Pen plot graph**
  - Up to 32 pens can be used. A history of alarms and messages can also be displayed in the window.
- **Bar chart graph**
  - Process, historical, and closing data can be edited into spreadsheets, indicating their tag names, types, and processing procedures. The logging function then automatically gathers the data, processes them, and displays results in the spreadsheet in pre-determined cells.
- **Three-dimensional graph**
  - Temperature distribution data and other plant condition data can be shown in relation to measured positions. Multiple sets of measured data can be displayed in time-order, to suit individual needs.

Logging Function
This display tool converts the saved trend data and displays them in the following seven chart formats:
- **X - R management charts**
  - The mean value (X) and dispersion range (R) of a production lot are displayed, making quality control easier.
- **X - 0 management charts**
  - The mean value (X) and dispersion deviation (0) of a production lot are displayed, making quality control easier. This is especially useful for large production volumes.
- **Pareto chart**
  - This chart shows the causes of product defects, in order of seriousness.
- **Scatter plot**
  - This chart is ideal for showing interrelationships between two factors.

Histograms
The distribution of measured values and their occurrence rate are shown in a bar chart.

Pie charts
Pie charts are used to show product composition ratios, etc.

Deviation totalization graphs
Deviation values (the total of process target set-point values and measured values) are shown in a bar-segment graph. This is useful for analyzing drift trends.

Statistical Quality Control (SQC) Function
This display tool converts the saved trend data and displays them in the following seven chart formats:
- **X - R management charts**
  - The mean value (X) and dispersion range (R) of a production lot are displayed, making quality control easier.
- **X - 0 management charts**
  - The mean value (X) and dispersion deviation (0) of a production lot are displayed, making quality control easier. This is especially useful for large production volumes.
- **Pareto chart**
  - This chart shows the causes of product defects, in order of seriousness.
- **Scatter plot**
  - This chart is ideal for showing interrelationships between two factors.

Yokogawa’s Rich Experience and Advanced Know-how
With its cutting-edge batch-control technology and expertise exhibited over many years, Yokogawa has developed an ideal batch-control environment for easy operation and efficient engineering. The CS Batch, which meets ISA S88 standards, is a comprehensive batch process operation and management package designed for flexible application to lot-varied, multi-product production.

CS Batch Functions Meeting ISA S88 Standards
CS Batch can be connected freely and simply to supervisory recipe and information management systems.

Recipe Management
Production equipment, procedures, methods, and parameters can be planned and edited using the recipe creation panel.

Program Languages To Suit the Purpose
Unit procedures and sequences are written using the SFC language. Unit-sequence phases use SEBOL, sequence tables, or logic charts. The SFC status panel displays the progress of sequence execution.

Unit Supervision
The batch unit management function is applicable to a wide range of operations, from operations at a batch plant to those at a continuous process plant. Plant equipment and instruments are conveniently grouped into units for individual operation and control, allowing instant reaction to any irregularity.
All Conceivable Functions Are Integrated To Ensure Precision Control

A New-Generation Integrated Control Station - Excellent Reliability and Efficiency

Control stations must of course be extremely reliable and efficient. Recognizing this, Yokogawa has developed a new-generation control station integrating instrumentation control (I), electric control (E), and computer functions (C). The new IEC-integrated control station draws on the proven reliability of the "pair-and-spare" design. The open yet highly reliable system is complete with control functions and hardware offering many exclusive features, while the installed open software implements robust security measures.

- The proven "pair-and-spare" design ensures a fault-tolerant system.
- The compact remote I/O unit has largely reduced field-wiring costs and space.
- A complete lineup of available FCS's support I/O signal points and application capacity.
- The application capacity can be freely distributed, according to plant size.
- Block engineering, which integrates instrumentation control and electric control, can be performed.
- The batch control function meets ISA S88 standards.

FCS Composed of FCU, Nodes and Connecting RIO buses

Field Control Unit (FCU)
The FCU is the computing unit of the FCS. Its process controller uses RISC chips to ensure high-speed processing and excellent functionality.

Node (Remote I/O Unit)
Field I/O signals are connected to this device. It converts and transmits the signals to the FCU. The node is connected to the FCU via a remote I/O (RIO) bus. It is composed of an I/O unit connecting field signals or subsystems, and a node interface unit for communications with the FCU.

I/O Unit
The I/O unit is composed of an I/O module and a supporting nest. The I/O module processes various field signals while communicating with the FCU.

- Analog I/O Module
  This is a multi-functional module composed of four modules. It can be adapted to different I/O signals by varying its capacity, using software. It is capable of ordinary linearization, square-root extraction, and special linearization processing. Each of the four modules processes one group of signals in a completely distributed configuration, ensuring high control-loop system efficiency.

- Multiplexer Module
  The multiplexer module is employed to process multi-point I/O signals, and is well suited for monitoring and a simple control loop.

- Contact I/O Module
  This module has built-in compound action functions, such as edge-detecting pulse input counting, variable pulse-width output, and time ratio ON/OFF output, in addition to its basic status I/O processing function.

Communications Module
The three communications modules (RS-232C, RS-422 and RS-485) are used to communicate with various programmable logic controllers (PLCs) by downloading necessary protocols.

Fieldbus Communications Module
This is an interface module for communicating with the Fieldbus.

RIO bus
The RIO bus (Remote Input/Output Bus) is a communications bus that can be made dual-redundant, connecting the FCU and the node. A repeater or optical repeater can be used for long-distance transmission. Nodes can be added to the RIO bus or changed without interrupting the operation of the FCU or other nodes.

Field control station configuration

Field Control Unit (FCU)
Node Interface unit
I/O units

Fieldbus
Communications

$I/O$ modules

Subsystem
PLC, etc.

Contact I/O
Multiplexer I/O
Analog I/O
$\text{RS-232C, RS-422, RS-485}$

$(PLC=\text{Programmable Logic Controller})$
A Variety of Function Blocks for Progressive Upgrading

Function and Faceplate Blocks Support Advanced Instrumentation and Electrical Control Functions

Various control function blocks and faceplate blocks can be linked freely and flexibly with one another, providing advanced instrumentation and electrical control functions for the control station.

Function Blocks
The function blocks are the basic control elements to configure a control system. They can be optionally combined to set up a control system that is most suitable for your purpose.

Regulatory Control Blocks
These function blocks compute process data for monitoring and control. PID control, input indicator, manual operation, signal selection, self-tuning, and other function blocks are available.

Sequence Control Blocks
These function blocks control interlocking, process-monitoring, and other sequences of looped equipment. Sequence tables, logic charts, and other sequence description methods can be used.

Calculation Blocks
These function blocks assist regulatory and sequence control functions. Analog and contact signal computation, high-speed trend data computation, and other computation blocks are available.

SEBOL Block
This function block permits use of the SEBOL language. This language can describe ideal batch control functions, enabling simple adaptation to more advanced sequence control.

SFC Block
This function block permits the use of the sequential function chart (SFC), which graphically describes sequence control. The function meets IEC SC65A/WG6 standards.

Faceplate Blocks
These are man-machine interface function blocks which permit the operator's identification of multiple function blocks as one tag. They are available in analog, sequence, and hybrid types.

Subsystem Integration Function
More plant equipment and large electric motors are now being incorporated with programmable controllers for monitoring and automation. In addition, many analyzers and measurement devices are becoming more intelligent. These advances mean that these subsystems all create greater demand for data exchange.

The FCS is equipped with a function that permits communications with these subsystems, integrating them for total system control. Modules or dedicated nodes can be used for subsystem communications where vast amounts of data are transferred.
Yokogawa's Next-generation FCS

A controller-freezing glitch while your plant is in operation could seriously disrupt the entire production schedule. The CENTUM CS system employs dual redundancy for much of its equipment, from the V net communications function and node buses to the RISC chip-incorporated process controller (CPU). In the event of a glitch, control of the processor cards is instantly transferred to the standby card without a moment's failure, ensuring unimpaired high-speed processing and reliability.

“Pair-and-spare” Design

The “pair-and-spare” design, with dual-redundant processor card and CPU, offers functions not possible in conventional standby redundancy design.

- Transient computation errors, which can be triggered by electric noise or caused at an initial failure stage, are detected when the two CPUs make computational comparisons. This function is backed up instantly using the standby processor card.
- The standby processor card executes control computations at all times, in synchronization with the current processor card. Thus control continuity is maintained regardless of card transfers.
- The “pair-and-spare” design has also contributed to an impressive improvement in computation-error detection for the CPU.
- The design also relieves system-designers from the extremely complicated engineering task of making allowances for cases of discontinuity, when preparing an FCS-compatible user control program.

Dual-redundant FCS components:
- Processor cards
- CPU
- V net
- Communication buses
- Power system
- RIO buses
- I/O modules
Engineering Support at Every Stage
System engineering begins the moment a system is conceptualized, and continues through design, manufacture, testing, startup, functional modifications and additions, upgrading, and so on. The CENTUM CS engineering function provides optimum capability and support for a friendly work environment at each of these stages, with complete system support.

Open Engineering Environment and Short Lead Time
To rationalize system generation and debugging operations, which make up the bulk of engineering work, the CENTUM CS engineering environment is available at the ICS and PICS as well as engineering workstations. This lets a number of engineers work together, and effectively shortens the lead time required for engineering.

Full-fledged Testing Functions To Meet Your Needs
With the CENTUM CS test function, the status of the test subject action is displayed on the engineering workstation in the same way it is displayed on the ICS operation panel. Thus, the engineer can view the actual operation image while running a test, and can effectively test FCS processes.

FCS Simulation Function
FCS functions and operations can be tested using a simulator. Just one engineering workstation is needed to use this FCS simulator, allowing modifications to be made to the currently running system without using an actual FCS.

Wireless-debug Function
This function performs tests using an actual FCS. In the test, software-provided I/O signals are used instead of actual field wiring. The wireless de-bug function permits more elaborate testing operations than would otherwise be possible.
Uniform Builder Environment for Effortless System Generation

Simplified Builder Operations

Builder Panels
Motif-standard windows are used. Window display format and operations are uniform, can be easily learned, regardless of builder type.

CAD-oriented Builders
Graphic, drawing, and logic-chart builders adapt CAD-oriented methods for using a mouse, ensuring easy-to-grasp graphic visualization of the overall interrelated content. Fill-in-the-form (FIF) format is used for other builders requiring data and character entries.

Self-documentation Function
The database list created with a builder can be printed out as required. This function is also used effectively for system configuration, maintenance, equipment additions, and modifications. In addition, the relationship between a specified tag name and another tag can be retrieved and printed out, as can the control drawing or graphics panel used.

Yokogawa’s Impressive Engineering Capabilities

Experienced Engineers Support Precise System Configuration
System configuration projects involve a series of engineering tasks at every step of the process. And these tasks must be performed in a limited period of time. Yokogawa’s engineering experts perform these tasks in any industry—refining, chemical or petrochemical products, iron and steel, nonmetal and ceramic, pulp and paper, food, pharmaceutical products, electric power, gas and oil, water and wastewater, textile, and so on. Our engineers have a thorough knowledge of plants and control systems. They are capable of performing tasks during every aspect of the project, to ensure installation of a system that fits your needs.

User-oriented Feasibility Studies
Fully understanding what the user needs is the first requirement in any engineering assignment. Yokogawa conducts a thorough feasibility study of your processes and plant, working in coordination with you. We also draw up future concepts. Yokogawa believes that looking at a job from the customer’s point of view is the basis of any engineering task.

Detailed Project Planning
Cost estimation, scheduling, and other details are presented only after the total vision of your project has been clearly grasped.

Forward-looking System Engineering
Yokogawa’s abundant resources — application technologies, experience, and know-how extending from continuous processes to batch and discrete processes — are put to advantage when design the most ideal control system for your plant. The result will be integrated as a library to allow application to plant expansion and future projects.

Project Management for Success
The success of a project depends almost entirely on project management. Yokogawa’s engineers manage and coordinate the progress of the entire project at every stage. Their efforts ensure that the project progresses smoothly as scheduled.

Start-up Service
Yokogawa assigns its expert engineers to your plant to ensure safe and untroubled start-up of the system and designed plant operation.
**Application Software Packages**

**Refined Software Packages**

**Support Advanced System Operations**

Plant operations constantly demand improved control and maximized cost stabilization, in the search for higher yield and quality. Yokogawa has an extensive lineup of advanced software packages ready for application at all levels of production control - operation, management, production, simulation, and so on. These highly reliable packages are the result of Yokogawa’s unique technologies and rich expertise, and are designed to help you cut costs, increase efficiency and improve quality.

**Batch-control Packages**

**CS Batch package**

This comprehensive package includes complex batch-process operation and control software which meets ISA S88 standards.

**Standard recipe data management package**

This software is used to file large amounts of recipe data at the ICS, load the required data from the file, and use them to execute a control sequence. The package permits operation monitoring and data gathering. It also supports batch processing of equipment modules in various arrangements.

**Fuzzy logic control package**

With this package, the expertise of skilled operators and engineers, which cannot easily be measured, is made applicable to actual control operations. The IF-THEN rule and membership functions are used in describing the expertise acquired during many years of practice. This software is ideal for the automation of plants where operations depend on the experience and intuition of skilled operators.

**Process-database packages**

**Management Information Function (MIF) Package**

This package collects process data and ICS historical data. The gathered data can be displayed using an exclusive trend window, or statistically computed and presented as an SQC chart. In addition, closing and other data can be edited into spreadsheets.

**Advanced-control Packages**

**Multivariable model predictive control (DMC/didcm-Y) package**

This package enables the use of AspenTech’s multivariable model predictive controller for DCS level control. Unlike conventional identification models, the controller used here has an algorithm that supports non-linear processing and permits online model-gain modifications.

**Predictor package**

This software uses its own process model for the on-line prediction of process actions, and computes the most appropriate control output according to predictions. This permits stable, automatic control of a process, using a technology superior to proportional integral derivative (PID) control.

**TriFellows package**

This software provides a Windows-based personal computer with various functions: long-term process-data storage, spreadsheet creation, trend-chart display, graphical monitor display, and software printer. Databases can be created for each distributed control system (DCS), permitting one client to access all DCS data in a client-server system configuration.

**P&ID Lab (trend file management, operation, analysis tool) package**

The management of ICS trend files and various analyses of these files can be executed on a personal computer. This software tool uses a system of menus and provides a programming-free analytical environment.

**Operation Support Packages**

**Exapro-plus (advanced operation support system) package**

This is an expert system designed for building process operation monitoring, fault-diagnosing, and fault-detecting systems. It can also be used to configure an advanced alarm system with precise fault-tracking capabilities.

**Exaview (process data acquisition, control and management) package**

This package performs the real-time collection, management and storing of regulatory process data and messages. The saved data may be used to obtain closing data, output in spreadsheets, ASCII- or RDB-converted, etc.

**DDE communications function package**

A Windows-based personal computer can be used to access PCS process data and ICS trend data, historical data and closing data. The data can then be used with a personal computer for reference, setting, editing and analysis. It can also be collected by the PC periodically, then used to generate spreadsheets and charts.

**Industrial Packages**

**Offsite control blocks package**

This is a package of function blocks designed for application to the flow rate, batch, and preparation control at an offsite petroleum production facility.

**B/M7000 XL single-window package**

**Training Package**

**Plantutor (training simulator) package**

This is a simulation program used to train plant operators. It comes with a tool for easy creation of process models. Trainees can learn how to start up, operate and shut down a highly automated plant, and learn procedures to follow in many simulated situations, including emergencies.

**Exanip (scheduling) package**

A plant operation schedule can be created automatically, following a production plan. The schedule can be easily formulated, whether production is multi-product/multi-lot, or involves advanced, complex processes. The resulting schedule is displayed using a Gantt chart.

**LinkforSap communications package**

This key operation package provides the interface for SAP R/3 PP-PI (made by SAP A.G Co., Ltd.). Regulatory or batch-controlled plant data can be directly connected to an enterprise information system. This permits downloading of production instructions generated by the SAP product, and uploading of CENTUM CS production data.
Maintenance and Utility Function
Safeguard System Performance

**I/O Module Replacement with no Interruption in Operation**

CENTUM CS I/O modules can be replaced easily and quickly without affecting other I/O modules or interrupting plant operations.

**On-line Maintenance without Interrupting the FCS Function**

One should not have to shut down the entire FCS when adding or modifying its control functions. The on-line maintenance function allows database creation and loading for each control area, control drawing, and function block, without interrupting FCS operation.

**Strict, Round-the-clock Diagnostics Throughout the Entire System**

An extremely advanced and complex production system must be continually monitored to ensure normal operation.

The CENTUM CS system maintenance function monitors and diagnoses ICS and FCS system conditions during operation. Its monitor function permits monitoring of the status of each individual I/O module. The utility function can be used to manage builder-generated databases, track the history of modifications, and load and save of software and FCS parameters.

**Example of On-line Function-block Maintenance**

<table>
<thead>
<tr>
<th>System status panel</th>
<th>Current ICS status panel</th>
<th>FCS status panel</th>
<th>Developed FCS status panel</th>
</tr>
</thead>
</table>

- **System maintenance function**
  - System maintenance
  - System alarm message display
  - FCS status display
  - Current ICS status display
  - Equalization function
  - Operation environment setup function

- **ICS ACG**
- **FCS**
- **System status panel**
- **Current ICS status display**
- **FCS status display**
- **Equalization function**
- **Operation environment setup function**

- **Control areas**
- **Control drawings**
- **Function block**

I/O Module Replacement with no Interruption in Operation

CENTUM CS I/O modules can be replaced easily and quickly without affecting other I/O modules or interrupting plant operations.
Complete Support To Keep Your Plant Up to Optimum Standards

Round-the-clock Support Every Day of the Year
The Field Support Center of Yokogawa Engineering Service Corporation (YSV) is in charge of supporting CENTUM CS systems in operation. Support is available 24 hours a day, 365 days a year. Various support menus are offered for the convenience of users. The Center is equipped with an analytical support system and security lock-installed dedicated offices. The Center assures quick troubleshooting and finds solutions, with our customer service engineers (CSE) in different parts of the world working in coordination with clients.

Total Maintenance Management System (BEST)
A maintenance plan and inspection schedule is determined for each plant, based on the results of plant diagnoses. This prevents unnecessary maintenance and reduces maintenance costs. The BEST system optimizes the maintenance program by effectively combining maintenance menus, selecting them according to the determined inspection cycle and the system’s overall condition and environment.

Remote Maintenance Support
The user’s CENTUM CS system and our Field Support Center are connected via telephone for round-the-clock diagnosis of the remote maintenance support system. Our experienced system engineers analyze the situation immediately when the user system has a glitch, and quickly find a solution.

Our remote maintenance support system is available for CENTUM CS systems wherever they are in operation. Overseas user systems can be connected to the support system via telecommunication satellites. This ensures the same reliability, whether the plant is located in Japan or abroad.

Servicing-support Information System
This system supports the work of our customer service engineers. They are constantly provided with updated information on our products, error case histories, maintenance support, distribution, etc. This information helps them minimize plant downtime and prevents breakdown recurrence.

Automated Notification System
During on-line monitoring, any indication of a malfunction is transmitted to the operator’s personal computer or beeper. This system permits centralized monitoring of system equipment located in different parts of factory, and saves manpower too.
Comprehensive Training Gives Your Staff CENTUM CS Expertise

From the Basics to System Management
CENTUM CS hardware and software are highly dependable, but they still require trained operators to keep the system running optimally. At a Yokogawa Training Center your personnel will become all-round CENTUM CS system experts after undergoing comprehensive training by our professional instructors, who are experienced professionals in their field.

Training Programs Available Globally
Our training centers are located in major parts of the world, offering various training courses in local languages. Special courses given at your company are also available on demand.

CENTUM CS Training Courses

Basic Course
This course is for operators and engineers not yet familiar with digital instrumentation systems, and for those intending to take the engineering course. They will learn the basics of the ICS operation and monitoring function and the FCS control function, and gain hands-on operation experience.
Curriculum:
- CENTUM CS system configuration
- Control station configuration
- ICS operation principles
- Controller functions
- ICS operation training
- Sequence control functions and training
- ICS process report functions and training
- Utility functions and training
- System maintenance functions and training

Engineering Course
This curriculum is for engineers who will be placed in charge of system design, instrumentation and maintenance. Trainees will operate EWS to learn system configuration definition methods, regulatory and sequence control function preparation, operation and monitoring function preparation, etc. They will also try out their own programs using the test function.
Curriculum:
- ICS and FCS hardware configuration
- Startup of EWS
- System configuration and use of ICS builders
- Use of FCS builders
- Regulatory control functions and training
- Detailed instrument specifications
- File management
- Test function
- Sequence control functions and training
- Use of graphic builders and training

System Management Course
This course is for those who will be responsible for system management or maintenance. The course covers periodic ICS and FCS inspection and ICS and EWS-incorporated system management.
Curriculum:
- File management and on-line maintenance
- Self-documentation functions
- ICS system management (install, backup, etc.)
- EWS system management (install, backup, etc.)

Management Information Function (MIF) Package Course

CS Batch Package Course

User-C Language Course

Other courses are offered as required.

Special training courses are available at a Center for your new employees, or for staff involved in plant construction. We also give special courses and conduct training on site.
Yokogawa's Global Sales and Service Network

YOKOGAWA ELECTRIC CORPORATION
World Headquarters
World Sales Headquarters
9-32, Nakacho 2-chome, Musashino-shi, Tokyo 180-8750, Japan
Tel.: 81-422-52-5634  Fax.: 81-422-52-9802

North America
Manufacturing/Sales/Service Offices
YOKOGAWA CORPORATION OF AMERICA
Headquarters & Plant
Georgia, U.S.A.
East Regional Office
Georgia, U.S.A.
Mid-West Regional Office
Illinois, U.S.A.
South-West Regional Office
Texas, U.S.A.

South America
YOKOGAWA America Do Sul S.A.
Brazil

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YOKOGAWA EUROPE B. V.
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