General Specifications

GS 33G01B10-01E

Integrated Production Control System System Specifications



GENERAL

This GS describes the system specifications, system components, and network specifications of the Integrated Production Control System, CENTUM CS.

SYSTEM COMPONENTS AND FUNCTIONS

The CENTUM CS system consists of several hardware and various software packages which run on them.

1. System Components

The CENTUM CS hardware consists of stations connected to the V net, and peripherals connected to the stations.

1.1 Stations Connected to the V net

Information and Command Station (ICS)

The Information and Command Station is configured of Information and Command Unit (ICU) and basic software.

The software license of the basic software (Model SIH1100) is supplied with the ICU.

- Information and Command Station (Console type) (Hardware Model: AIH21C)
- Information and Command Station (Desktop type) (Hardware Model: AIH00D)

Field Control Station (FCS)

The Field Control Station is configured of Field Control Unit (FCU) and basic software.

The software license of the basic software (Models SFE1100,SFH1100) is supplied with the FCU.

- Field Control Station (19" Rack Mountable Type) (Hardware Models: AFE10S, AFM10S, AFS10S)
- Duplexed Field Control Station (19" Rack Mountable Type) (Hardware Models: AFE10D, AFM10D, AFS10D)
 Field Control Station (with Cabinet)
- (Hardware Models: AFE20S, AFM20S, AFS20S) • Duplexed Field Control Station (with Cabinet)
- (Hardware Models: AFE20D, AFM20D, AFS20D) Bus Converter
- Bus Converter (abbreviated as BCV) (Models: ABC11S, ABC11D)

The software license of the basic software (Model SBC12 \square 0) is supplied with the BCV.

Communication Gateway Unit

 Communication Gateway Unit (abbreviated as ACG) (Model: ACG10S)

The software license of the basic software (Model SGW12 \square 0) is supplied with the ACG.

1.2 Peripherals

- Serial Printer (Model: YPR120)
- Color Hard Copy Unit (Model: YPR520)
- Magnetic Cartridge Tape Unit (Model: YLM55□)
- Optical Bus Repeater (for V net, RIO bus) (Models: YNT511S, YNT511D, YNT521S (*1), YNT521D (*1), YNT522D (*2))
 - *1: YNT521S and YNT521D are used for the RIO bus only.
 - *2: YNT522D is used for the V net only.
- Bus Repeater (for V net, RIO bus) (Models: YNT512S, YNT512D)
- I/O Expanded Cabinet (Model: ACB21)
- I/O Unit Expansion Rack (Model: ARK11)
- Node Interface Unit(Models: ANS , AND)
- Process I/O Module Nest
- Process I/O Module, Communication Module
- Bus Cable (for V net, E net, RIO bus)
- Dedicated Desk(Model: YAX101)
- General-Purpose Printer Desk (Model: YAX211)
- Printer Desk for YPR (Model: YAX212)

2. Optional Software

The system consists of two types of software: basic software whose software licenses are supplied with the hardware, and optional software listed below.

Please note that it is not allowed to use software with different release numbers (different versions software) together. When using software, check the release number ($R\Box$).

Optional software marked * must be used only with software with Release R2.

Operation and Monitoring Software Packages for ICS

- Ethernet Communication Driver (Model: SIH2110)
- RS-232C Communication Driver (Model: SIH2120)
- Enhanced Security Package (Model: SIH4010)*
- Half-Size Window Display Package (Model: SIH4110)
- Graphic 4 Times Size Panel Display Package (Model: SIH4120)
 External VO Next Support Package
- External I/O Nest Support Package (for Recorder Output) (Model: SIH4150)
- External I/O Nest Support Package (for Expanded Keys) (Model: SIH4160)
- Voice Output Package (Model: SIH4170)
- Computer Window Package (Model: SIH4180)
- Control Drawing Status Display Package (Model: SIH4410)
- Logic Chart Status Display Package
 (Model: SIH4420)
- SEBOL Status Display Package (Model: SIH4430)*
- SFC Status Display Package (Model: SIH4440)*
- Historical Message/Trend Text Conversion Package (Model: SIH4820)*



Management Information Function Software Packages for ICS

- Data Acquisition Package (Model: SIH6500)
- Long-Term Trend Display Package (Model: SIH6510)
- SQČ Package (Model: SIH6520)
- Logging Package (Model: SIH6530)
- Data Acquisition Definition Builder (Models: SIH5500, SHW5500)
- Long-Term Trend Builder
- (Models: SIH5510, SHW5510)
- SQC Builder (Models: SIH5520, SHW5520)
- Logging Builder (Models: SIH5530, SHW5530)

FCS Standard Control Functions

- Sensor Parameter Communication Package (Models: SFE2610, SFH2610)
- Off-Site Block Package (Model: SFH8620)

FCS Subsystem Communication Package

- FA500/FÁ-M3 Communication Package (Models: SFE2210, SFH2210)
- MELSEC-A Communication Package (Models: SFE2261, SFH2261)
- Gas Chromatograph Communication Package for Communication Node (Models: SFE2350, SFH2350)
- MELSEC-A Communication Package for Communication Node (Models: SFE2361, SFH2361)

FCS Advanced Control Functions

- Fuzzy-logic Control Package (Models: SFE3310, SFH3310)
- Fuzzy-logic Control Support Package (Models: SIH6310, SHW6310)
- PREDICTROL Package (Models: SFE3330, SFH3330)*
- PREDICTROL Support Package
- (Models: SIH6330, SHW6330)*

Batch Management Package

- CS Batch Recipe Management Package (Model: SIH6600)*
- CS Batch Process Management Package (for ICS) (Model: SIH6610)*
- CS Batch Process Management Package (for FCS) (Model: SFH3130)*
- Unit Supervision Package (for ICS) (Model: SIH6620)*
- Unit Supervision Package (for FCS) (Model: SFH3131)*
- CS Batch Recipe Management Builder (Model: SHW5160)*
- CS Batch Process Management Builder (Model: SHW5161)*
- Unit Supervision Builder (Model: SHW5162)*
- CS Batch Self-Documentation (Model: SHW5170)*
- CS Batch Production Planning and Scheduling Interface (Model: SIH6662)*
- CS Batch Production Information Management Interface (Model: SIH6663)*
- CS Batch Recipe Management Interface (Model: SHW6661)*
- Standard Batch Report Package (Model: SIH6690)*
- Standard Batch Report Builder (Model: SHW5175)*

Recipe Data Management Package

- Standard Recipe Data Management Package (Model: SIH6680)*
- Client Recipe Data Management Functions (Model: SIH6681)*
- Recipe Data Management Builder (Model: SHW5130)*
- Recipe Data Management Self-Documentation (Model: SHW5131)*

Valve Pattern Monitor Package

 Valve Pattern Monitor Package (Models: SFH3132, SHW5163)*

System Generation Builder Functions

- Standard Builder Functions (Models: SIH5100, SHW5100)
- System Definition Functions
- (Models: SIH5101, SHW5101) • System Utility (Models: SIH5102, SHW5102)
- Maintenance Utility (Models: SIH5102, SHW5102)
- ICS Builder (Models: SIH5110, SHW5110)
- Operator Utility (Models: SIH5110, SHW5110)
- Note: Operator Utility (Models. SIH5111, SHW5111) Note: Operator Utility (Model: SIH5111) is necessary when the operator changes panel assignments and other items from the ICS during operation. Furthermore, the Standard Builder Functions (Model: SIH5100) is necessary for the operation of Operator Utility.
- FCS Builder (Models: SIH5120, SHW5120)
- Graphic Builder (Models: SIH5150, SHW5150)
- Bus Converter Builder (Models: SIH5210, SHW5210)
- Communication Gateway Builder (Models: SIH5240, SHW5240)
- Tag List Generation Package (Models: SIH5310, SHW5310)
- Standard Self-Documentation Package (Models: SIH5490, SHW5490)
- Enhanced Self-Documentation Package (Models: SIH5492, SHW5492)
- Sensor Parameter Definition Package (Models: SIH5610,SHW5610)
- Off-Site Block Builder (Models: SIH5620, SHW5620)

Test Functions Packages

- FCS Simulation Communication Package (Model: SIH5420)*
- Wireless Debugging Package (Model: SHW5410)
- FCS Simulation Package (Model: SHW5420)

C Language

- C Language Execution Control Package (Model: SIH5021)
- C Language Development Environment Package (Model : SHW5030)

Multilingual Packages

- Multilingual Package (Model: SIH120^[])*
- Multilingual Package (Model: SHW509D)*

DDE Communication Packages

- DDE Server Package (Model: SSS2410)*
- Remote Server Package for DDE (Model: SIH2410)*
- DDE Communication Builder (Models: SIH5860, SHW5860)*

Fieldbus Tools

- Engineering Tool for Fieldbus (Model: SSS5700)*
- Device Management Tool for Fieldbus (Model: SSS6700)*

3. ICU (AIH21C/AIH00D) and Software Combinations

When using software in the ICU (AIH21C/AIH00D), it is recommended to follow the conditions below.

- Installable parameters ≥ Total parameters of installed functions
- Installable parameters: Indicates the ICU capacity of functions installed in the ICU. It depends on the ICU main memory capacity.
- Installed parameters: Indicates the ICU capacity required for installing the desired functions.
- When using system generation builder function for ICS, main memory must be more than 64 Mbytes (When using ICU with stacked display, it must be more than 96 Mbytes.).
- System generation builders for ICS cannot be used with a Management Information Function (MIF) package.

Installable Parameters

Main Memory Capacity	Console Type (Standard) ICU and Desktop Type ICU	Console Type (with Stacked display) ICU			
48 Mbyte	1	-			
64 Mbyte	2	2			
96 Mbyte	4	4			

Note: Console (with stacked display) requires a main memory of 64 Mbyte or more.

Installed Parameters

Functions	Console Type (Standard) and Desktop Type ICU	Console Type (with Stacked display) ICU			
Operation and Monitoring Panels 1 Graphic 4 Times Size Panel Display Control Drawing Status Display Logic Chart Status Display 	0.3	0.6			
Operation and Monitoring Panels 2 Half-Size Window Display 	1	2			
MIF Packages	0.6				
Recipe Data Management Packages	1				
CS Batch	1				
C Language	0.6				
Others	0				

Note: The software packages corresponding to the functions are as follows.

Operation and Monitoring Panels 1	SIH4120, SIH4410, SIH4420
Operation and Monitoring Panels 2	SIH4110
Management Information Functions (MIF)	SIH6500, SIH6510, SIH6520, SIH6530
Recipe Data Management	SIH6680, SIH6681
CS Batch	SIH6600, SIH6610, SIH6620, SIH6662, SIH6663
C Language	SIH5021
For functions with more than one correspon	ding package, the parameters do not change even if only one package or all
packages are installed.	

Recommended Combination Examples

	Console Type (Standard) ICU and Desktop Type ICU				Console Type (with Stacked display) ICU				
Functions	Main Memory 48 Mbyte		Main Memory 64 Mbyte		Main Memory 96 Mbyte	Main Memory 64 Mbyte		Main Memory 96 Mbyte	
	<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>	<9>
Operation and Monitoring Functions 1	Х	-	-	Х	Х	-	Х	Х	Х
Operation and Monitoring Functions 2	-	Х	Х	Х	Х	Х	-	Х	Х
MIF	X	-	-	Х	Х	-	X	Х	-
Recipe Data Management	-	-	X	-	Х	-	-	-	-
CS Batch	-	-	-	-	Х	-	-	-	Х
C Language	-	-	-	-	-	-	-	-	-
Others	X	X	Х	Х	Х	X	X	Х	Х
Total Installed Parameters	0.9	1	2	1.9	3.9	2	1.2	3.2	3.6
Installable Parameters		1		2	4		2	4	ŀ

Note: "X" indicates the package is installed in the ICU, but "-" indicates it is not.

SYSTEM SPECIFICATIONS

ICS Monitoring Tags Maximum of 100000 tags

Minimum System

A minimum system consists of one ICS and one FCS.

Maximum System

In CENTUM CS, a system which does not use a BCV is called a domain. The system configuration for one domain is shown below.

Stations	Max. No. of Stations
ICS FCS BCV ACG Builder WS Integrated Operation/Monitoring Station	A total of up to 64 stations can be connected. Of this, the number of ICSes must be 16 or fewer.

Expanded System

By using a BCV to connect multiple systems in a hierarchy, you can create a system that is larger than the maximum system given above. You can integrate computers and other control systems in a hierarchy, with a CENTUM CS at its center.

Total no. of interconnected domains: up to 16

Total no. of stations in multi-domain system: up to 256

Hierarchy: three-level, i.e. computer hierarchy, CENTUM CS hierarchy, subsystem hierarchy No. of ICS-monitored tags: Max. 100000 tags

Connecting device: BCV Bus Converter



Figure System Configuration

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NETWORK SPECIFICATIONS

CENTUM CS uses 3 types of networks for communication with the configuring stations.

V net

Uses

The V net is a network for real-time process control to connect system components together.

- Communication Specifications Max. No. of Stations Connectable: 64 per domain Communication Method: Read/Write communication, message communication, link transmission Link Transmission Period: 100 msec. to 2 sec. with 1 type of link transmission period which can be set Line Access Control: Token passing method Transmission Path Specifications
- Network Topology: Bus topology
- Transmission Path Redundancy: Dual-redundant
- Transmission Speed: 10 Mbit per sec.
- Transmission Cable:
 - Coaxial cable (YCB111, YCB141)
 - One grounding unit (YCB117) per segment (*1) should be used when connecting YCB111 cable.
- Optical fiber cable (YNT511D/YNT522D type optical bus repeater used)
- Transmission Distance:
- With Coaxial Cables:
 - Transmission distance: Max. 500 m (*2)
- *1.
- If repeaters are used on V net, each part of the V net segregated by a repeater is referred to as a segment. However, when using VF701 card in PICS, the YCB141 V net cable (10BASE-2 cable) needs to be used for connecting the *2: control bus via the Control bus Conversion Unit. Since the YCB111 V net Cable (10BASE-5 cable) and YCB141 V net cable (10BASE-2 cable) are mixed in transmission route, the transmission distance must satisfy the following formula: $\dot{\text{C}}$ Length of YCB141> + 0.4 x < Length of YCB111> \leq 185 m
 - Moreover, in a segment that segregated by the Bus Repeaters or the Optical Bus Repeaters, up to 4 conversion units or 30 stations can be used as long as the sum of the number of stations and the number of conversion units is equal to or less than 30.
- For Bus Repeater and Optical Bus Repeater:
- Maximum extension distance per bus repeater (YNT512S, YNT512D) is 500 m.
- Maximum extension distance for a pair of optical bus repeater (YNT511S, YNT511D) is 4 km.
- Maximum extension distance for a pair of optical bus repeater (YNT522S, YNT522D) is 15 km.
- Maximum number of bus repeater and optical bus repeater mountable between any two stations is 8. Optical bus repeater; however, must be used in pairs.
- Transmission distance is limited by the number of bus repeater.
- I = 24 n
 - L: transmission distance (km)
 - n: number of bus repeater and optical bus repeater

Total transmission distance is the lesser of the sum of the maximum extension distance for each device and coaxial cable length, or L, calculated above.



Figure: Example of Optical Bus Repeater Connection

Example 1: From HIS001 to FCS001

When a pair of optical bus repeater for 15 km is mounted,

transmission distance depending on the number of bus repeater and optical bus repeater = 24 - 2 = 22 km, the sum of the maximum extension distance for each device and coaxial cable length = 0.5 + 15 + 0.5 = 16 km. Therefore, the total transmission distance is 16 km.

Example 2: From HIS001 to FCS004

When 4 optical bus repeaters (one pair of 4 km and one pair of 15 km) are mounted,

transmission distance depending on the number of bus repeater and optical bus repeater = 24 - 4 = 20 km, the sum of the maximum extension distance for each device and coaxial cable length = 0.5 + 4 + 0.5 + 15 + 0.5 = 20.5 km.

Therefore, the total transmission distance is 20 km.

Example 3: From FCS001 to FCS004

When 6 optical bus repeaters (one pair of 4 km and two pairs of 15 km) are mounted,

transmission distance depending on the number of bus repeater and optical bus repeater = 24 - 6 = 18 km, the sum of the maximum extension distance for each device and coaxial cable length = 0.5 + 15 + 0.5 + 4 + 0.5 + 100

- 15 + 0.5 = 36 km.
- Therefore, the total transmission distance is 18 km.

Maximum number of pairs for optical bus repeater:

It is possible to use four sets of 2 optical bus repeaters.

The following indicates an example of optical bus repeater connection.



Figure: Example of Optical Bus Repeater in Star Type Connection

- E net
- Uses
- The E net is an information network within the system which connects ICSes within the domain together. • Communication Specifications
- Connectable Devices: ICS (max. 16) and builder WS Line Access Control: CSMA/CD method
- Transmission Path Specifications Network Topology: Bus topology Transmission Speed: 10 Mbit per sec. Transmission Cable: Coaxial cable Transmission Distance: Max. 185 m

• Uses

The RIO bus is a remote I/O communication bus which connects the intelligence portion (FCU) and the remote I/O portion (node) of the FCS together.

 Communication Specifications Max. No. of Devices Connectable: 8 nodes

Transmission Path Specifications

Network Topology: Bus topology

Transmission Path Redundancy: Dual-redundancy possible

Transmission Speed: 2 Mbit per sec.

Transmission Cable:

Twisted pair cable

Optical fiber cable

(YNT5□1□ type optical bus repeater used)

Transmission Distance:

With Twisted Pair Cables:

Transmission distance: Max. 750 m

For Bus Repeater and Optical Bus Repeater:

Maximum extension distance per bus repeater (YNT512S, YNT512D) is 750 m Maximum extension distance for a pair of optical bus repeater (YNT511S, YNT511D) is 4 km

Maximum number of bus repeater and optical bus repeater mountable between any two stations is 8.

Optical bus repeater; however, must be used in pairs

Transmission distance is limited by the number of bus repeater.

 $L = 30 - 2.5 \times n$

L: transmission distance (km)

n: number of bus repeater and optical bus repeater

Total transmission distance is the lesser of the sum of the maximum extension distance for each device and coaxial cable length, or L, calculated above.

■ FIELDBUS SPECIFICATIONS

Fieldbus System Configuration



F02.ai

Figure Fieldbus System Configuration (Tree Type)

Fieldbus Specifications

Transmission speed: 31.25 kbps Max. connectable device: 32/segment Cable: Shielded twisted pair cable Power supply to connected devices: Available Intrinsic Safety: Available Connected device example: Transmitter, control valve, field multiplexer

■ INSTALLATION AND ENVIRONMENTAL CONDITIONS

The installation and environmental conditions of the CENTUM CS system components are as follows:

 Ambient Temperature 0 to 50 °C (FCS and peripherals) 5 to 40 °C (ICS and peripherals) Ambient Humidity 10 to 90 %RH (FCS and peripherals) 20 to 80 %RH (ICS and peripherals) No condensation Temperature Change Rate ±10 °C per hour Power Supply Dependent on power supply specifications of a device. 100-120 V AC Spec: Voltage 100-120 V AC ±10 %; Frequency 50/60 ±3 Hz 220-240 V AC Spec: Voltage 220-240 V AC ±10 %; Frequency 50/60 ±3 Hz 24 V DC Spec: Voltage 24 V DC ±10 % • Withstanding Voltage 100-120 V AC and 220-240 V AC: AC 1500 V for 1 minute 24 V DC: AC 500 V for 1 minute Insulation Resistance 20 MΩ/500 V DC The devices below are 10 M Ω /500 V DC. YPR120, YPR520 YAX101, YAX211, YAX212 Grounding Up to $100^{\circ}\Omega$ Noise Electrical Field (excl. CRT): Up to 3 V/m (26 MHz to 1.0 GHz) Up to 3 V/m (1.4 to 2.0 GHz) Up to 1 V/m (2.0 to 2.7 GHz) Magnetic Field (excl. CRT): Up to 400 A/m (AC, DC) Magnetic Field (CRT): Up to 0.4 A/m (AC), Up to 8 m/A (DC) Static: Up to 4 kV (direct discharge) Continuous Vibration Displacement amplitude: Up to 0.25 mm (1 to 14 Hz) Acceleration: Up to 2.0 m/s² (14 to 100 Hz)

REGULATORY COMPLIANCE

The standards that the CENTUM CS hardware components conform to are listed below. See respective General Specifications to confirm each device's compliance information.

Safety Standards (*1) (*2) (*3) [CSA] CAN/CSA-C22.2 No.61010-1 [CE Marking] Low Voltage Directive EN61010-1 and EN 61010-2-030

EMC Conformity Standards (*2)

[CE Marking] EMC Directive EN 55011 Class A Group 1 (*4) EN61000-6-2 (*5) EN61000-3-2 (*6) EN61000-3-3 (*7) [C-Tick Marking] EN55011 Class A Group 1 (*4) [KC Marking]

Korea Electromagnetic Conformity Standard

Standards for Hazardous Location Equipment

[CSA Non-Incendive] (*8)

Class I, Division 2, Groups A, B, C and D Temperature code T4 CAN/CSA-C22.2 No. 0-M91 CAN/CSA-C22.2 No. 0.4-04 CAN/CSA-C22.2 No. 157-92 C22.2 No. 213-M1987 TN-078 (for 100-120 V AC and 24 V DC power supply)

- Note: According to the New Approach Directive, the manufacturer and representative office in EU are indicated below: Manufacturer: YOKOGAWA Electric Corporation (2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan). Representative office in EU Community: Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, The Netherlands).
- *1: For ensuring all the hardware devices to satisfy the safety standards, the dedicated breakers in the power supply distribution board must conform to the following specifications. [CSA] CSA C22.2 No.5 or UL 489
 - [CE Marking] EN 60947-1 and EN 60947-3
- *2: To conform to the safety standards and the EMC conformity standards, install the 19-inch rack mountable type devices in a keyed metallic cabinet.
- *3: Measurement inputs of this equipment are applied to Measurement category I for IEC/EN/ CSA 61010-1:2001 and O
- (Other) for EN 61010- 2-030. For details, see "CENTUM CS Installation Guidance" (TI 33G01J10-01E). 4: A Class A hardware device is designed for use in the industrial environment.
- *4: A Class A hardware device is designed for use in the indus Please use this device in the industrial environment only.
- *5: A lightening arrestor or the like is required to meet this surge immunity standard.
- *6: An external device such as a power unit with harmonic current neutralizer and an active harmonics conditioner must be connected to meet this harmonic current emission standard.
- *7: The specified limits of voltage drop across wiring must be satisfied to meet this standard.
- *8: To meet a standard for hazardous location equipment, the 19-inch rack mount devices must be approved by CSA in Canada, or must be installed in a keyed metallic cabinet approved by non-incendive regulator in your area.

TRADEMARKS

- CENTUM is a registered trademark of Yokogawa Electric Corporation.
- Ethernet is a registered trademark of XEROX Corporation.
- HP is a registered trademark of Hewlett-Packard Company.
- MELSEC-A is a registered trademark of Mitsubishi Electric Corporation.