General Specifications

GS 33J15C10-01EN

VP6F1700, VP6F1705
Control Function for Field Control Station (for AFV30☐/AFV40☐)
Control Function for FCS Simulator (for AFV30☐/AFV40☐)

CENTUM VP

[Release 6]

■ GENERAL

Control Function is a software package that works on a Field Control Station (FCS). VP6F1700 Control Function for Field Control Station (for AFV30☐/AFV40☐) is installed in any of the following Field Control Unit (FCU) models and runs as FIO system control function:

*AFV30S, AFV30D, AFV40S, AFV40D, A2FVX1 (*1) (*2)*

*1: This is the model for FCU kit that Processor Module (CP471), Power Module (PW481/PW482/PW484), and Baseplate (A2BE1D) can be ordered collectively as a unit.
*2: A2FVX1 is supported on R6.01.10 or later.

Both VP6F1700 Control Function for Field Control Station and VP6F1705 Control Function for FCS Simulator have the same functional specifications, except that one runs on the real machine and the other on a simulator.

This document describes the common contents for both models, unless noted otherwise.

■ FUNCTIONAL SPECIFICATIONS

The control functions are described by the structure of the functions and their elements.

● Structure of Control Functions

The Control Function for Field Control Station consists of several types of function blocks and input/output functions.

Multiple function blocks and inputs/outputs are arranged on a control drawing, and configure flows of signals and sequential orders of controls.

Function Block
A function block is the smallest element to perform control and calculation.

Control Drawing
A control drawing consisting of one or more function locks and inputs/outputs describes a part of control of plant equipment. A group of control such as cascade control or fuel/air ratio control composes of a control drawing.

Input/Output Function
Input/output function is composed of process input/output and software input/output.

The process input/output exchanges data between external devices. The software input/output is a virtual element that is inside an FCS.

● Function Block

The function blocks basically consist of regulatory control blocks, calculation blocks, sequence control blocks, faceplate blocks, and unit instruments. Valve pattern monitors, off-site blocks, and PID with packet loss compensation (for field wireless) are provided as options. By combining these function blocks a control drawing is conigured.

Regulatory Control Block
These function blocks perform continuous process control.

• Input Indicator Block:

PVI	Input Indicator
PVI-DV	Input Indicator with Deviation Alarm

• Controller Block:

PID	PID Controller
PI-HLD	Sampling PI Controller
PID-BSW	PID Controller with Batch Switch
ONOFF	2-Position ON/OFF Controller
ONOFF-E	Enhanced 2-Position ON/OFF Controller
ONOFF-G	3-Position ON/OFF Controller
ONOFF-GE	Enhanced 3-Position ON/OFF Controller
PID-TP	Time-Proportioning ON/OFF Controller
PD-MR	PD Controller with Manual Reset
PI-BLEND	Blending PI Controller
PID-STC	Self-Tuning PID Controller

• Manual Loader Block:

MLD	Manual Loader
MLD-PVI	Manual Loader with Input Indicator
MLD-SW	Manual Loader with Auto/Man SW
MC-2	2-Position Motor Control
MC-2E	Enhanced 2-Position Motor Control
MC-3	3-Position Motor Control
MC-3E	Enhanced 3-Position Motor Control

• Signal Setter Block:

RATIO	Ratio Set
PG-L13	13-Zone Program Set
BSETU-2	Flow-Totalizing Batch Set
BSETU-3	Weight-Totalizing Batch Set

• Signal Limiter Block:

VELLIM	Velocity Limiter

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• Signal Selector Block

AS-H/M/L	Signal Selector
SS-H/M/L	Auto-Selector
SS-DUAL	Dual-Redundant Signal Selector

• Signal Distributor Block:

FOUT	Cascade Signal Distributor
FFSUM	Feed-Forward Signal Summing
XCPL	Non-Interference Control Output
SPLIT	Control Signal Splitter

• Alarm Block:

ALM-R	Representative Alarm (*1)

*1: Classified as the sequence element 2 in the FCS database.

• Pulse Count Input Block:

PTC	Pulse Count Input

• YS Instrument Block:

SLCD	YS Controller
SLPC	YS Programmable Controller
SLMC	YS Programmable Controller with Pulse-Width Output
SMST-111	YS Manual Station with SV Output
SMST-121	YS Manual Station with MV Output Lever
SMRT	YS Ratio Set Station
SBSD	YS Batch Set Station
SLCC	YS Blending Controller
SLBC	YS Batch Controller
STLD	YS Totalizer

• Foundation Fieldbus Faceplate Block:

FF-AI	Fieldbus Analog Input
FF-DI	Fieldbus Discrete Input
FF-CS	Fieldbus Control Selector
FF-PID	Fieldbus PID Control
FF-RA	Fieldbus Ratio
FF-AO	Fieldbus Analog Output
FF-DO	Fieldbus Discrete Output
FF-OS	Fieldbus Output Splitter
FF-SC	Fieldbus Signal Characterizer (Totalizer)
FF-IT	Fieldbus Integrator
FF-IS	Fieldbus Input Selector
FF-MDI	Fieldbus Multiple Discrete Input
FF-MDO	Fieldbus Multiple Discrete Output
FF-MAI	Fieldbus Multiple Analog Input
FF-MAO	Fieldbus Multiple Analog Output
FF-SUNV	Simple Universal

Calculation Block

These function blocks perform data calculation.

•Arithmetic Calculation Block:

ADD	Addition
MUL	Multiplication
DIV	Division
AVE	Averaging

•Analog Calculation Block:

SQRT	Square Root
EXP	Exponential
LAG	First-Order Lag
INTEG	Integration
LD	Derivative
RAMP	Ramp
LDLAG	Lead/Lag
DLAY	Dead-Time
DLAY-C	Dead-Time Compensation
AVE-M	Moving-Average
AVE-C	Cumulative-Average
FUNC-VAR	Variable Line-Segment Function
TPCFL	Temperature and Pressure Correction
ASTM1	ASTM Correction: Old JIS
ASTM2	ASTM Correction: New JIS

•Logic Operation Block:

AND	Logical AND
OR	Logical OR
NOT	Logical NOT
SRS1-S	Set-Dominant Flip-Flop with 1 Output
SRS1-R	Reset-Dominant Flip-Flop with 1 Output
SRS2-S	Set-Dominant Flip-Flop with 2 Output
SRS2-R	Reset-Dominant Flip-Flop with 2 Output
WOUT	Wipeout
OND	ON-Delay Timer
OFFD	OFF-Delay Timer
TON	One-Shot (rising-edge trigger)
TOFF	One-Shot (falling-edge trigger)
GT	Comparator (greater than)
GE	Comparator (greater than or equal)
EQ	Equal Operator
BAND	Bitwise AND
BOR	Bitwise OR
BNOT	Bitwise NOT

• General-Purpose Calculation Block:

CALCU	General-Purpose Calculation
CALCU-C	General-Purpose Calculation with String I/O

• Calculation Auxiliary Block:

SW-33	3-Pole 3-Position Selector Switch
SW-91	1-Pole 9-Position Selector Switch
DSW-16	Selector Switch for 16 Data
DSW-16C	Selector Switch for 16 String Data
DSET	Data Set
DSET-PVI	Data Set with Input Indicator
BDSET-1L	1-Batch Data Set
BDSET-1C	1-Batch String Data Set
BDSET-2L	2-Batch Data Set
BDSET-2C	2-Batch String Data Set
BDA-L	Batch Data Acquisition
BDA-C	Batch String Data Acquisition
ADL	Station Interconnection

Sequence Control Block

These function blocks perform interlock and batch control sequences.

• Sequence Table Block:

ST16	Sequence Table
ST16E	Rule Extension Sequence Table

• Logic Chart Block:

LC64	Logic Chart
LC64-E	External Connection Logic Chart

• SFC Block:

_SFCSW	3-Position Switch SFC
_SFCPB	Pushbutton SFC
_SFCAS	Analog SFC

• Switch Instrument Block:

SI-1	Switch Instrument with 1 Input
SI-2	Switch Instrument with 2 Inputs
SO-1	Switch Instrument with 1 Output
SO-2	Switch Instrument with 2 Outputs
SIO-11	Switch Instrument with 1 Input and 1 Output
SIO-12	Switch Instrument with 1 Input and 2 Outputs
SIO-21	Switch Instrument with 2 Inputs and 1 Output
SIO-22	Switch Instrument with 2 Inputs and 2 Outputs
SIO-12P	Switch Instrument with 1 Input, 2 One-Shot Outputs
SIO-22P	Switch Instrument with 2 Inputs, 2 One-Shot Outputs
SI-1ALM	Switch instrument with 1 input and discrete-status alarm (*1)

*1: Supported by R6.04 or later.

• Enhanced Switch Instrument Block:

SI-1E	Enhanced Switch Instrument with 1 Input
SI-2E	Enhanced Switch Instrument with 2 Inputs
SO-1E	Enhanced Switch Instrument with 1 Output
SO-2E	Enhanced Switch Instrument with 2 Outputs
SIO-11E	Enhanced Switch Instrument with 1 Input and 1 Output
SIO-12E	Enhanced Switch Instrument with 1 Input and 2 Outputs
SIO-21E	Enhanced Switch Instrument with 2 Inputs and 1 Output
SIO-22E	Enhanced Switch Instrument with 2 Input and 2 Outputs
SIO-12PE	Enhanced Switch Instrument with 1 Input, 2 One-Shot Outputs
SIO-22PE	Enhanced Switch Instrument with 2 Inputs, 2 One-Shot Outputs

• Sequence Auxiliary Block:

TM	Timer (*1)
CTS	Software Counter (*1)
CTP	Pulse Train Input Counter (*1)
CI	Code Input (*1)
CO	Code Output (*1)
RL	Relational Expression (*2)
RS	Resource Scheduler (*2)
LSW	32-Point Local Switch (*2) (*3)

*1: Classified as the sequence element 1 in the FCS database.
*2: Classified as the sequence element 2 in the FCS database.
*3: Supported by R6.03 or later.

• Valve Monitoring Block:

VLVM	Valve Monitoring (*1)

*1: Classified as the sequence element 2 in the FCS database.

Faceplate Block

The faceplate blocks have a human-machine interface function that enables a single tag to represent several function blocks.

• Analog Faceplate Block:

INDST2	Dual-Pointer Indicating Station
INDST2S	Dual-Pointer Manual Station
INDST3	Triple-Pointer Manual Station

• Sequence Faceplate Block:

BSI	Batch Status Indicator
PBS5C	Extended 5-Pushbutton Switch
PBS10C	Extended 10-Pushbutton Switch

• Hybrid Faceplate Block:

HAS3C	Extended Hybrid Manual Station

Unit Instrument, Unit Operation Instrument, and Operation

Devices and instruments to control a plant are integrally defined as a single unit, and control and operation of the plant are performed by the unit.

• Unit Instrument:

_UTAS	Analog Unit Instrument
_UTPB	Unit Instrument with 5-Pushbutton Switch
_UTSW	Unit Instrument with 3-Position Switch

• Non-Resident Unit Instrument:

_UTAS-N	Analog Non-Resident Unit Instrument
_UTPB-N	Non-Resident Unit Instrument with 5-Pushbutton Switch
_UTSW-N	Non-Resident Unit Instrument with 3-Position Switch
_UTAS-SN	Analog Non-Resident Unit Instrument with Recipe Operation
_UTPB-SN	Non-Resident Unit Instrument with 5-Pushbutton Switch and Recipe Operation
_UTSW-SN	Non-Resident Unit Instrument with 3-Position Switch and Recipe Operation

• Unit Operation Instrument:

UTOP-SN	Non-Resident Unit Operation Function Instrument

• Operation:

OPSFC	SFC-Type Operation
OPSFCP1	SFC-Type Operation with Floating-Data Parameters
OPSFCP2	SFC-Type Operation with Character-Data Parameters
OPSFCP3	SFC-Type Operation with Floating/Character-Data Parameters
OPSFC4	SFC-Type Operation with Integer/Character-Data Parameters
OPSFC5	SFC-Type Operation with Floating/Integer-Data Parameters

Valve Pattern Monitor

This function block monitors open/close status of valves for transfer systems in a plant.

• Valve Pattern Monitor:

VPM64	64-Data Valve Pattern Monitor
VPM128	128-Data Valve Pattern Monitor
VPM256	256-Data Valve Pattern Monitor
VPM512	512-Data Valve Pattern Monitor
VPM64A	64-Data Valve Pattern Monitor with Alarm
VPM128A	128-Data Valve Pattern Monitor with Alarm
VPM256A	256-Data Valve Pattern Monitor with Alarm
VPM512A	512-Data Valve Pattern Monitor with Alarm

The valve pattern monitor is provided as an optional package (VP6F3132).

Off-Site Block

This function block controls mixing and shipment of products at off-sites of oil refineries.

• Off-Site Block:

FSBSET	Batch Set Control Block
BLEND	Blending Master Control Block

The off-site block is provided as an optional package (VP6F8620).

PID with Packet Loss Compensation (for Field Wireless)

This PID block has a compensation mechanism for packet losses of on data communications with wireless field devices.

• PID with Packet Loss Compensation (for Field Wireless):

ZWOPID	PID Controller with Output Loss Compensation for Wireless

The PID with Packet Loss Compensation (for Field Wireless) is provided as an optional package (VP6F3210).

● Software Input/Output

This a virtual input and output function that is realized on the software inside an FCS.

Internal Switch

This serves as a buffer for storing statuses.

%SW	Common Switch
%GS	Global Switch

Message Output

This function notifies events from an FCS to other FCS, HIS, and/or computers.

• Annunciator Message:

%AN	Annunciator Message

• Sequence Message:

%PR	Print Message
%OG	Operator Guide Message
%VM	Multimedia Start Message
%RQ	Sequence Message Request

• Event Massage:

%CP	Supervisory Computer Event Message
%M3	Supervisory Computer Event Message for PICOT
%EV	Signal Event Message
%RE	SFC/SEBOL Return Event Message

● Process Control Input/Output

This exchanges data between an FCS and field devices or subsystems outside of the FCS.

Process Input/Output
This function exchanges signals between field devices and an FCS.

%Z	Process Input/Output

Communication Input/Output
This function enables to access various types of data that are handled by subsystems, such as programmable logic controllers (PLC).

%W/%X	Communication Input/Output

Fieldbus Input/Output
This function enables to access various types of data that are handled by field devices on the Fieldbus.

%Z	Fieldbus Input/Output

● Subsystem Communication Function

The standard control function enables to exchange various data with subsystems and field devices through communication functions. The following communication types are available. For more details, refer to each General Specifications (GS).

Serial Communication
GS 33J60G10-01EN “Models ALR111, ALR121 Serial Communication Module (for N-IO/FIO)”

Ethernet Communication
GS 33J60G11-01EN “Model ALE111 Ethernet Communication Module (for N-IO/FIO)”

FOUNDATION Fieldbus Communication
GS 33J60G20-01EN “Model ALF111 FOUNDATION Fieldbus Communication Module (for N-IO/FIO)”

PROFIBUS-DP Communication
GS 33J60G85-01EN “Model ALP121 PROFIBUS-DP Communication Module (for N-IO/FIO)”

PROFINET Communication
GS 33J60G90-01EN “Model A2LP131 PROFINET Communication Module (for N-IO/FIO)”

For more details about the communication function, refer to each hardware GS.

● Features of VP6F1700 Control Function

System Function Block
These blocks act as interfaces for notifying statuses of an FCS internal operation outside of the FCS such as HIS. The system function blocks are created automatically on defining the FCS; however, these function blocks are not shown in the control drawings.

CPU load information
Communication load information
I/O load information
SEBOL operation information

Periodic SEBOL
The periodic SEBOL works during the basic scan processing, which enables sequence controls to be described by programing languages, other than sequence tables or logic charts.

PID Controller with Output Loss Compensation for Wireless
In the PID control using wireless field devices, the "PID Controller with Output Loss Compensation for Wireless" block which tolerates occurrence of packet losses is available by an option. By using this function block, the process response can be stabilized when the wireless communications are recovered from packet losses.

■ APPLICATION CAPACITY

Application capacity represents the number of control functions that can be executed simultaneously. The table below shows application capacity of an FCS.

The application capacity of VP6F1705 Control Function for FCS Simulator is as the same as that of VP6F1700.

Table Application Capacity

Item		AFV30□/AFV40□		
		VP6F1700-V1□C01 (Standard)	VP6F1700-V1□C02 (Expanded)	VP6F1700-V1□C03 (Large)
No. of Tags	Elements per FCS (*1)	18000	18000	18000
	Function blocks (*2)	3500	3500	7000
Process I/O	Analog I/O points	1760	1760	1760
	Contact I/O points	4096	4096	4096
Communication I/O (*3)	Data volume (in 16-bit units)	8000	8000	8000
Internal Switches	Common switches	9000	9000	9000
	Global switches	256	256	256
Message Outputs	Annunciator messages	2000	2000	2000
	Print messages	2000	2000	2000
	Operator guide messages	1000	1000	1000
	Sequence message request	200	200	200
	Event messages	1000	1000	1000
Control Functions	Control drawings	200	200 (300/400/500) (*4)	
1 second Trend	Acquisition points	1024	1024	1024
ADL Points	Number of accesses to other stations	512	512	512

*1: This indicates the number of tags that can be assigned to the contact inputs/outputs (%Z elements), common switches (%SW elements), global switches (%GS elements) , and communication inputs/outputs (%WB/%XB elements). The number of tags assignable to %WB/%XB is up to 4000 each.
*2: This indicates the number of tags assignable to function blocks (%BL) and annunciators (%AN).
*3: Normal communication inputs/outputs (%WW, %WB) occupy 4000 words and enhanced communication inputs/outputs (%XW, %XB) occupy 4000 words, and the sum of these is 8000 words.
*4: When the control capacity is either C02 (expanded type) or C03 (large type), the number of control drawings can be selected from 200, 300, 400, or 500. The default number is 200. When selecting 300 or more control drawings, the total number of FCS in the entire project may be restricted. Refer to "Integrated Production Control System CENTUM VP System Overview" (GS 33J01A10- 01EN) for more details.

● Scan Period

The scan period that the CPU of the FCS executes the standard control functions can be selected among the three as shown below. The scan period can be specified by the function block.

Standard Scan Period: 1 sec.
Medium Speed Scan Period: Select 200 or 500 ms. (*1)
Used mainly for analog data computation and control.
Fast Scan Period: Select 200 or 500 ms. (*1)
Used mainly for sequence control.

*1: 50, 100 or 250 ms can be specified by inputting the numerical value directly.

The above scan periods do not include the I/O signal conversion time of nodes, and bus transmission time.

● Database

The number of function blocks is defined for each database type. Select the database type at system generation time, according to your business needs.

The number of function blocks for each database type is shown below:

Table Database

Item	General type			Batch type		
	VP6F1700-V1□C01 (Standard)	VP6F1700-V1□C02 (Expanded)	VP6F1700-V1□C03 (Large)	VP6F1700-V1□C01 (Standard)	VP6F1700-V1□C02 (Expanded)	VP6F1700-V1□C03 (Large)
Nodes (*1)	14	14	14	14	14	14
ALF111	64	64	64	64	64	64
ALR, ALE, ALP, AGS, AGP (*2)	32	32	32	32	32	32
Communication Modules (*3)	64	64	64	64	64	64
Regulatory Control Blocks/Calculation Blocks (FF-FP Blocks) (*4) (ZWOPID Blocks) (*5)	500 (500) (100)	1200 (1200) (100)	1800 (1500) (100)	400 (400) (100)	1000 (1000) (100)	1500 (1000) (100)
Sequence Blocks (Standard) (*6)	200	400	700	100	200	400
Sequence Blocks (M-size) (*7)	100	200	400	50	100	150
Sequence Blocks (L-size) (*8)	100	200	300	50	100	150
General-Purpose Calculations	400	500	750	120	250	350
SFC Blocks	40	100	300	100	200	300
Operation Blocks	200	400	500	250	500	700
Switch Instrument Blocks (*9)	800 (500)	1000	1500	800 (500)	1000	1500
Sequence Elements 1	500	700	1100	500	700	1100
Faceplate Blocks	120	200	300	50	100	150
Logic Operation Blocks	100	200	300	50	100	150
Sequence Elements 2	100	200	300	50	100	150
Batch Data Blocks	100	400	600	50	100	150
Unit Instruments (*9)	20 (30)	60	80	20 (30)	60	80
Unit Operation Instruments	0	0	0	150	300	400
Offsite Blocks	30	40	60	0	0	0
Valve Pattern Monitors	0	0	0	0	0	0
System Function Blocks	4	4	4	4	4	4
SEBOL Daemon	630	630	630	840	840	840
SEBOL User Function	210	210	210	280	280	280
Control Recipe Area	1 MB	1 MB	1 MB	8 MB	8 MB	8 MB
Option Area	320 KB	320 KB	320 KB	320 KB	320 KB	320 KB

*1: The number of nodes include the CPU node.
*2: This is the sum of ALR111, ALR121, ALE111, ALP111, ALP121, A2LP131, AGS813, and AGP813. However, logical I/O points might restrict the maximum number of modules mentioned in the table above.
*3: This is the sum of ALR111, ALR121, ALE111, ALP111, ALP121, A2LP131, AGS813, AGP813, and ALF111.
*4: The number of Foundation fieldbus faceplate (FF-FP) blocks is included in regulatory control blocks/calculation blocks. Note that in the case of C03 (Large) type, the maximum number of faceplate blocks becomes fewer than the regulatory control blocks/ calculation blocks.
*5: The number of PID controller with output loss compensation for wireless (ZWOPID) blocks is included in the regulatory control blocks/calculation blocks.
*6: Standard: Sum of input and output is 64 and 32-rule.
*7: Medium size: Total 96 is the sum of input (32 - 64) and outputs (32 - 64), and 32-rule.
*8: Large size: 64 inputs, 64 outputs, and 32-rule.
*9: The value in the brackets is supported by R6.03 or earlier.

Optional Area
In order to use the following functions of the Standard Control Function, optional areas in the database are required.

For Enhanced ON/OFF Controller, Enhanced Motor Control, and Enhanced Switch Instrument: 64 KB (*1)
For Off-site Block: 80 KB
For Valve Pattern Monitor: 90 KB
For PID controller with output loss compensation for wireless: 120 KB

*1: An optional area of 64 KB is consumed when any one of the three blocks is used.

The sum of the required functions should not exceed the size of the optional area in the database.

● Test Function (Virtual Test)

VP6F1705 Control Function for FCS Simulator is used in an environment where a Field Control Station is not connected.

■ OPERATING ENVIRONMENT

● Hardware Requirements

VP6F1700 Control Function for Field Control Station (for AFV30☐/AFV40☐) is used with the following FCU models:
AFV30S, AFV30D, AFV40S, AFV40D, and A2FVX1

VP6F1705 Control Function for FCS Simulator (for AFV30☐/AFV40☐) conforms to operating environment of VP6E5100 Standard Engineering Function.

■ MODELS AND SUFFIX CODES

Control Function for Field Control Station (for AFV30☐/AFV40☐)

		Description
Model	VP6F1700	Control Function for Field Control Station (for AFV30☐/AFV40☐)
Suffix Codes	-V	Software license
	1	Always 1
	1	English version
	C01	Standard type
	C02	Expanded type
	C03	Large type

		Description
Model	VP6F1700	Control Function for Field Control Station (for AFV30☐/AFV40☐)
Suffix Codes	-E	Expansion license
	1	Always 1
	1	English version
	C12	Capacity expansion (Standard type to Expanded type)
	C13	Capacity expansion (Standard type to Large type)
	C23	Capacity expansion (Expanded type to Large type)

Control Function for FCS Simulator (for AFV30☐/AFV40☐)

		Description
Model	VP6F1705	Control Function for FCS Simulater (for AFV30☐/AFV40☐)
Suffix Codes	-V	Software license
	1	Always 1
	1	English version
	C01	Standard type
	C02	Expanded type
	C03	Large type

		Description
Model	VP6F1705	Control Function for FCS Simulater (for AFV30☐/AFV40☐)
Suffix Codes	-E	Expansion license
	1	Always 1
	1	English version
	C12	Capacity expansion (Standard type to Expanded type)
	C13	Capacity expansion (Standard type to Large type)
	C23	Capacity expansion (Expanded type to Large type)

■ ORDERING INFORMATION

Specify model and suffix codes.

■ TRADEMARK ACKNOWLEDGMENT

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