CellStation

Connection to Automation System

10000005690 Revision 2.4

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CellStation	10000005690	2.4
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Contents

Page

1. Communications definitions

This manual is valid with the CellStation version 1.00.

Profibus DP technology is used for communication between a Distributed Control System (i.e.DCS) and CellStation nodes. The Siemens DP/DP Coupler in the CellStation cabinet must be connected with Profibus cable to a Profibus DP Master controller of the DCS and configured as a slave module using GSD file si018070.gse.

CellStation nodes are always slaves in the Profibus DP network and a unique slave address must be set for each CellStation using the dip switch on the DP/DP Coupler module.

To make the communication possible the DP/DP Coupler must be enabled. That can be set in the CellStation panel (default is enabled).

To get diagnostics data from the network state on both sides of the DP/DP Coupler the DIA switch must be set ON for both networks of the DP/DP Coupler.

The data structure is configured by defining items of different sizes from selection given by the GSD file. The structure on the both sides of the DP/DP Coupler must be equal but input/output functionality must be opposite.

The data structure on DCS side is given below:

Item number	Module type
0	64 Bytes Input consistent
1	64 Bytes Input consistent
2	64 Bytes Input consistent
3	32 Bytes Input consistent
4	16 Bytes Input consistent
5	64 Bytes Output consistent
6	64 Bytes Output consistent
7	64 Bytes Output consistent
8	32 Bytes Output consistent
9	16 Bytes Output consistent

Integer (INT) is two bytes and floating point (FLP) is four bytes. The values are stored in the data items in order where the most significant bytes (MSB) are in lower address bytes. This order is also called as ‘big endian’.

Because the Profibus data transfers are cyclical and independent from other DCS data producing and execution cycles it may be difficult to synchronize the data flows.

One method to prevent cyclically alternating value transfers is to keep the comparison value for each output value on the DCS and then store and send forward only changed values. After sending a new value DCS has to stop reading for a short while so that the new value gets enough time to circle via the CellStation back to input.

2. Contents of data messages

Data structures are described from DCS's point of view, i.e. input data is received from and output data sent to the CellStation. Because the structure and the contents of the input and output data messages are identical to each other, both having 120 words, they are described at the same time. The markings in the column "DCS In+Out" tell if the value is only input information to the DCS or if it is a parameter that can also be set by the DCS.

If the CellStation is equipped with the local panel any CellStation parameter can be entered from there, too. In that case all the parameters in the output message do not need to be set by the DCS.

There are three different ways to program the communication at DCS end.

1. All the parameters are entered from the DCS. This way must always be used if there is no local panel in the CellStation. DCS must keep the bit "Run-time parameters only" continuously OFF.
2. Only Run-time parameters are entered from the DCS. Then DCS must keep the bit "Run-time parameters only" continuously ON.
3. The user selects another subset of parameters to be entered from the DCS. In that case the user must take care of keeping the other parameters unchanged by copying them each cycle from the input message to the output message.

Columns of data structure:

Word #	Word number from 0 to 119 inside the data message.		
Bit #	Bit number from 0 to 15 inside the word.		
Description	Describes the use of the word(s) or the bit(s).		
Values	Range of the numerical value, meaning of the bit or a further explanation.		
DCS In+Out	In	=	Value is only input information to DCS.
	In+Out	=	Value is a parameter that DCS can read and also set unless the writing rights are limited with the bit 8 or 9 in the word 0
Run-time	R	=	Shows that the parameter belongs to the Run-time parameters and is allowed to be set by DCS when the bit 8 in the word 0 is ON.
Default value	Initial value of the parameter after loading the software first time to the CellStation.		

Word #	Bit #	Description	Values	DCS In+Out	Run-time	Default value
Communication Status Bits and Time Information						
0	Bit 0	Communication status between CellStation Profibus DP Master module and DP/DP Coupler .	Bit is controlled by the DP/DP Coupler. Network is working = 1	In		
	Bits 1-7	Not in use		In		
	Bit 8	Run-time parameters only	Run-time par.only =1, All parameters = 0. When the bit is set the DCS can set only the parameters marked with “R” in the column “Run-time” .	In+Out	R	0
	Bit 9	Local switch	Local ON =1, Local OFF = 0 When the bit is set the cell is controlled from the CellStation panel locally and the DCS cannot set any parameter. The priority of the bit 9 is higher than bit 8	In		
	Bits 10-15	Not in use		In		
1-4	Current date and time		BCD format in bytes: Byte 0: year (2 last digits) Byte 1: month (1-12) Byte 2: day of month (1-31) Byte 3: hour (0-23) Byte 4: minute (0-59) Byte 5: second (0-59) Byte 6: 2 MSDs of ms (0-99) Byte 7 (bits 4-7): LSD of ms Byte 7 (bits 0-3): day of the week (1-7, 1 = Sunday)	In+Out	R	0
Level Control Parameters						
5	Measurement value		INT, scaled into 0-32000	In		
6	Setpoint value		INT, scaled into 0-32000	In+Out	R	0
7	Control output value		INT, scaled into 0-32000	In+Out	R	0
8	P-term		INT, multiplied by 100. Negative sign reverses the control.	In+Out	R	80
9	I-term		INT, in seconds	In+Out	R	200
10	D-term		INT, in seconds	In+Out	R	0
11	Bit 0	Control loop MAN_ON state	Manual ON=1, Manual OFF (Auto ON)=0	In+Out	R	1
	Bit 1	Feedforward state	Feedforward ON=1, Feedforward OFF=0	In+Out	R	1
	Bit 2	Measurement instrument alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 3	Measurement high alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 4	Measurement low alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 5	Control loop deviation alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 6	Output signal alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 7	Not in use		In		
	Bit 8	1st control valve Stand-by state	Stand-by = 1, Active=0	In+Out	R	0
	Bit 9	2nd control valve Stand-by state	Stand-by = 1, Active=0	In+Out	R	0
	Bit 10	Not in use		In		
	Bit 11	Not in use		In		
	Bit 12	Not in use		In		
	Bit 13	Input signal inversion	Inverted = 1, Direct = 0	In+Out		1
	Bit 14	Output signal inversion	Inverted = 1, Direct = 0	In+Out		0
	Bit 15	PV tracking	Tracking ON = 1, Tracking OFF = 0	In+Out		1
12	Feedforward gain		INT, multiplied by 100	In+Out	R	100

Word #	Bit #	Description	Values	DCS In+Out	Run-time	Default value
1st Air Control Parameters						
13	Measurement value		INT, scaled into 0-32000	In		
14	Set point value		INT, scaled into 0-32000	In+Out	R	0
15	Control output value		INT, scaled into 0-32000	In+Out	R	0
16	P-term		INT, multiplied by 100. The sign reversal reverses the control.	In+Out	R	80
17	I-term		INT, in seconds	In+Out	R	60
18	D-term		INT, in seconds	In+Out	R	0
19	Bit 0	Control loop MAN_ON state	Manual ON=1, Manual OFF (Auto ON)=0	In+Out	R	1
	Bit 1	Not in use		In		
	Bit 2	Measurement instrument alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 3	Measurement high alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 4	Measurement low alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 5	Control loop deviation alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 6	Output signal alarm	Alarm ON = 1, Alarm OFF = 0	In		
	Bit 7	Not in use		In		
	Bit 8	Not in use		In		
	Bit 9	Not in use		In		
	Bit 10	Not in use		In		
	Bit 11	Not in use		In		
	Bit 12	Not in use		In		
	Bit 13	Not in use		In		
	Bit 14	Not in use		In		
	Bit 15	Not in use		In		
20	Not in use			In		
2nd Air Control Parameters						
21	Measurement value		INT, scaled into 0-32000	In		
22	Set point value		INT, scaled into 0-32000	In+Out	R	0
23	Control output value		INT, scaled into 0-32000	In+Out	R	0
24	P-term		INT, multiplied by 100. The sign reversal reverses the control.	In+Out	R	80
25	I-term		INT, in seconds	In+Out	R	60
26	D-term		INT, in seconds	In+Out	R	0
27	Status bits		See the word 19	In		
28	Not in use			In		
3rd Air Control Parameters						
29	Measurement value		INT, scaled into 0-32000	In		
30	Set point value		INT, scaled into 0-32000	In+Out	R	0
31	Control output value		INT, scaled into 0-32000	In+Out	R	0
32	P-term		INT, multiplied by 100. The sign reversal reverses the control.	In+Out	R	80
33	I-term		INT, in seconds	In+Out	R	60
34	D-term		INT, in seconds	In+Out	R	0
35	Status bits		See the word 19	In		
36	Not in use			In		

Word #	Bit #	Description	Values	DCS In+Out	Run-time	Default value

Other Parameters for Level and Air Controls

37-38	Level measurement	High alarm limit	FLP	In+Out	R	-100
39-40	Level measurement	Low alarm limit	FLP	In+Out	R	-400
41-42	Air measurements	High alarm limit	FLP	In+Out	R	8
43-44	Air measurements	Low alarm limit	FLP	In+Out	R	2
45-46	Level measurement	High range	FLP	In+Out		0
47-48	Level measurement	Low range	FLP	In+Out		-500
49-50	Air measurements	High range	FLP	In+Out		10
51-52	Air measurements	Low range	FLP	In+Out		0
53	Level measurement	Filtering time	INT, 0.1 sec	In+Out		10
54	Air measurements	Filtering time	INT, 0.1 sec	In+Out		0
55	Level measurement	Alarm delay	INT, sec, value	In+Out		0
56	Air measurements	Alarm delay	INT, sec, value	In+Out		0
57	Level measurement	Alarm hysteresis	INT, % of meas. range	In+Out		1
58	Air measurements	Alarm hysteresis	INT, % of meas. range	In+Out		1
59	Level control	Deadband	INT, % of meas. range	In+Out		1
60	Air controls	Deadband	INT, % of meas. range	In+Out		1
61	Level control output	Max rate of change	INT, % /sec., value 0 = not in use	In+Out		0
62	Air control outputs	Max rate of change	INT, % /sec., value 0 = not in use	In+Out		0
63	Level control	Deviation alarm limit	INT, % of meas. range, value 0 = not in use	In+Out		0
64	Air controls	Deviation alarm limit	INT, % of meas. range, value 0 = not in use	In+Out		0
65	Level control output	High limit	INT, 0-100 %	In+Out		100
66	Level control output	Low limit	INT, 0-100 %	In+Out		0
67	Air control outputs	High limit	INT, 0-100 %	In+Out		100
68	Air control outputs	Low limit	INT, 0-100 %	In+Out		0
69	Air measurements normalization factor		INT, multiplied by 100	In+Out		100
70	Bit 0	Air measurements, input signal inversion	Inverted = 1, Direct = 0	In+Out		0
	Bit 1	Air controls, output signal inversion	Inverted = 1, Direct = 0	In+Out		0
	Bit 2	Air controls, PV tracking	Tracking ON = 1, Tracking OFF = 0	In+Out		0
	Bits 3-15	Not in use		In		
71	Number of air controllers		INT	In+Out		3
72	Level control output MODE selector		INT	In+Out		1
73	Level control parameter 1 (reservation)		INT, 0-100 %	In+Out		0
74	Level control parameter 2 (reservation)		INT, 0-100 %	In+Out		0
75	Level control parameter 3 (reservation)		INT, 0-100 %	In+Out		0
76	Level control parameter 4 (reservation)		INT, 0-100 %	In+Out		0
77	1st Level control valve position (reservation)		INT, scaled into 0-32000	In		
78	2nd Level control valve position (reservation)		INT, scaled into 0-32000	In		
79	Not in use			In		

Station and Control Loop Identification Texts

80-87	CellStation Identification name	First word is the number of characters (same value in both bytes). The rest of the words contains the name, max 14 characters.	In+Out		CS-01
88-95	Level Control Tagname	-- " --	In+Out		LIC-001
96-103	1st Air Control Tagname	-- " --	In+Out		AIC-001
104-111	2nd Air Control Tagname	-- " --	In+Out		AIC-002
112-119	3rd Air Control Tagname	-- " --	In+Out		AIC-003

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Thank you for choosing the Outotec automation equipment.

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