Technical Information

FLXA402 4-Wire Converter
HART Communication

TI 12A01F01-61EN

Contents

YOKOGAWA

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This document describes HART communication by FLXA402 4-Wire Converter.
Before communicating using the HART protocol, refer to the User's Manual for the FLXA402 4-Wire Converter Operation of Converter IM 12A01F01-03EN for details of the parameters.

For latest User's Manual, download it from our website or scan QR code.

http://www.yokogawa.com/an/flxa402/download/

1. General

HART Communication superimposes specific waveforms called HART Communication waveforms on the 4–20 mA analog signal from a FLXA402 to enable remote intercommunication between the online FLXA402 and a setup tool (*).

*: FieldMate, Plant Resource Manager (PRM), or a handheld HART communicator may be used as the setup tool.
Note: When using FieldMate or a 375 Field Communicator, make sure you use the following or greater version of the product.
FieldMate R3.04.00 + Device Files R3.09.00

1.1 Installing DD files

To enable HART communication between a FLXA402 and setup tool, the device description (DD) file of the FLXA402 needs to be installed in the setup tool. The DD file contains the HART communication details and menu configurations specific to the FLXA402.

FieldMate is provided with the latest versions of DD files at the time when sold. The current version of DD files can be downloaded from the following site (*):

YOKOGAWA : https://www.yokogawa.com/an/download/an-dl-hart-001en.htm

(*): The URL s is subject to change without prior notice. If the URL cannot be accessed, consult your nearest sales office or the agency from which you purchased the product.

Before using FieldMate

Before using FieldMate, check the revision of Device Files.

Compatibility among revisions of FLXA402, FieldMate and DD file

HOUSING ASSY		FieldMate
Software revision	**Device revision**	**Revision of Device Files**
1.01.01 or later	1	R3.09 or later

The software revision and the device revision are shown on the display of FLXA402 Main or Home screen which is introduced by pressing the Detail. (Figure 1)

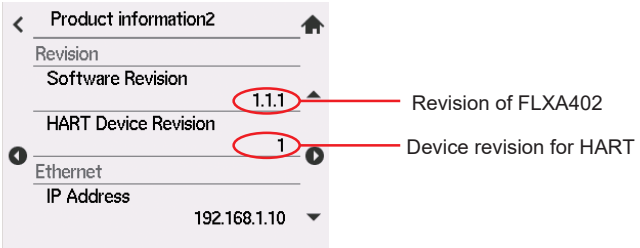


Figure 1 Software Revision

Installing DD File

For how to install the DD file, see the respective documentation for the setup tool you use.
For FieldMate R3.04.00+Device Files R3.09.00, installing DD File is not required.

Connecting Setup Tool

Connect HART modem at the both ends of the load resistance which is 250 ohms or larger and is installed between the setup tool terminals and mA1.

You can connect the setup tool to any interconnection terminals such as those in the central control room, a converter's junction box, or somewhere within the transmission loop.

1.2 Functions Available via HART Communication

FLXA402 via Hart communication enables the following settings: Error settings (4.7), mA output settings (4.3), Contact input settings (4.2), HART setting (4.6.2). Information on the sensor settings or calibration are available as Read only. The numbers in the parentheses correspond the section number in the User's Manual IM 12A01F01-03EN.

Correspondences between menu structure and FLXA402 front panel display

+– Converter Menu	..... Shows the information of the Slot 1 sensor in FLXA402
+– HOLD	..... Enables Manual HOLD
+– WASH	..... Not operational
+– Detail	..... Read only
+– Trend	..... Disables reference
+– Other	..... Disables reference
+– Reset	..... Disables reference
+– Setting	..... Setting changeable: ma Output, ma Input, HART
+– Lang	..... Disables reference
+– Alarm	..... Disables reference
+– sensor Menu	..... Displays information of sensors on Slot1
+– Detail	..... Read only
+– Calibration	..... Not executable
+– Reset Wellness	..... Not executable
+– Reset	..... Not executable
+– Setting	..... Read only

1.2.1 Multi-drop mode

Multiple number of field devices put in multi-drop mode can be connected in parallel on a single cable. To enable the multi-drop mode, set the device address to a unique number from 1 to 63.

NOTE

Multi-drop mode communication requires the devices on the link to be given unique device addresses for polling (polling addresses). If the same address is set in two or more devices, correct communication is disabled.

Canceling multi-drop mode:

To release a device from the multi-drop mode, set the polling address to zero.

1.2.2 Write protection

Turning the slide switches ON disables the setting via HART communication (default: OFF).

If you create a password at "Setting" on the display, it protects HART setting, disabling writing over HART parameters. See 1.3 in IM 12A01F01-03EN Operation of Converter

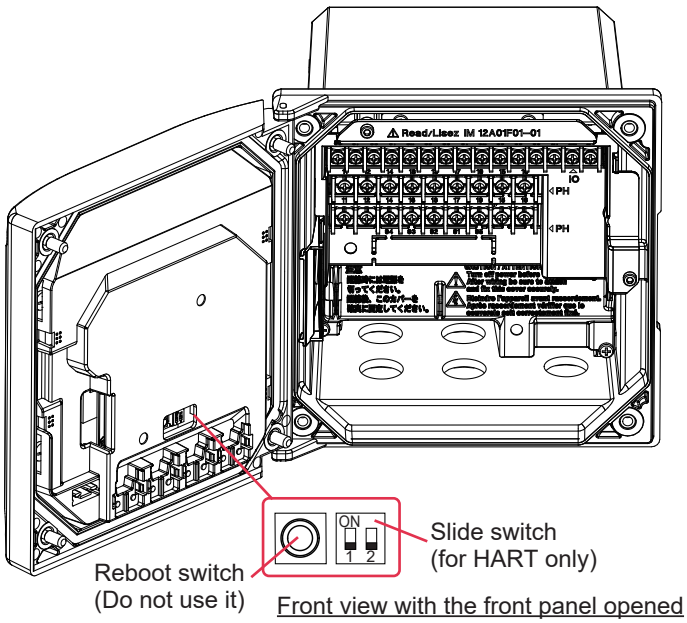


Figure 2 FLXA402

CAUTION

Slide switch 1 is for HART. DO NOT turn ON the Slide switch 2.

CAUTION

DO NOT push the button switch next to the Slide switches, when they are set to ON/OFF.

1.2.3 Device Variable Code

Use Device Variable Code for FLXA402 to set device variables from SV to QV.or to Read process values on Command 9.

Code	Name	PV	SV	TV	QV	
0	AO1 current	-	X	X	X	
1	AI	X	X	X	X	
2	Differential pH	X	X	X	X	
3	Differential ORP	X	X	X	X	
4	Differential Conduct	X	X	X	X	
5	Differential Resist	X	X	X	X	
6	Differential DO	X	X	X	X	
7	Average pH	X	X	X	X	
8	Average ORP	X	X	X	X	
9	Average Conduct	X	X	X	X	
10	Average Resist	X	X	X	X	
11	Average DO	X	X	X	X	
12	Ratio	X	X	X	X	
13	Passage	X	X	X	X	
14	Rejection	X	X	X	X	
15	Deviation	X	X	X	X	
16	pH calc	X	X	X	X	
17	Script 1	X	X	X	X	*1
18	Script 2	X	X	X	X	*1
19	Script 3	X	X	X	X	*1
20	Script 4	X	X	X	X	*1
21	Script 5	X	X	X	X	*1
22	Script 6	X	X	X	X	*1
23	Script 7	X	X	X	X	*1
24	Script 8	X	X	X	X	*1

Code	Name	PV	SV	TV	QV
25	Temp 1-1	X	X	X	X
26	pH 1-1	X	X	X	X
27	ORP 1-1	X	X	X	X
28	rH 1-1	X	X	X	X
29	Sensor mV1 1-1	-	X	X	X
30	Sensor mV2 1-1	-	X	X	X
31	Sensor mV3 1-1	-	X	X	X
32	Conduct1 1-1	X	X	X	X
33	Conduct2 1-1	X	X	X	X
34	Resist1 1-1	X	X	X	X
35	Resist2 1-1	X	X	X	X
36	Concent1 1-1	X	X	X	X
37	Concent2 1-1	X	X	X	X
38	USP 1-1	-	X	X	X
39	Sensor Ohms 1-1	-	X	X	X
40	Oxygen 1-1 *2	X	X	X	X
41	Sensor current 1-1 *2	-	X	X	X

42	Temp 2-1	X	X	X	X
43	pH 2-1	X	X	X	X
44	ORP 2-1	X	X	X	X
45	rH 2-1	X	X	X	X
46	Sensor mV1 2-1	-	X	X	X
47	Sensor mV2 2-1	-	X	X	X
48	Sensor mV3 2-1	-	X	X	X
49	Conduct1 2-1	X	X	X	X
50	Conduct2 2-1	X	X	X	X
51	Resist1 2-1	X	X	X	X
52	Resist2 2-1	X	X	X	X
53	Concent1 2-1	X	X	X	X
54	Concent2 2-1	X	X	X	X
55	USP 2-1	-	X	X	X
56	Sensor Ohms 2-1	-	X	X	X
57	Oxygen 2-1	X	X	X	X
58	Sensor current 2-1	-	X	X	X

59	Temp 1-2	X	X	X	X
60	pH 1-2	X	X	X	X
61	ORP 1-2	X	X	X	X
62	rH 1-2	X	X	X	X
63	Sensor mV1 1-2	-	X	X	X
64	Sensor mV2 1-2	-	X	X	X
65	Sensor mV3 1-2	-	X	X	X
66	Conduct1 1-2	X	X	X	X
67	Conduct2 1-2	X	X	X	X
68	Resist1 1-2	X	X	X	X
69	Resist2 1-2	X	X	X	X
70	Concent1 1-2	X	X	X	X
71	Concent2 1-2	X	X	X	X
72	USP 1-2	-	X	X	X
73	Sensor Ohms 1-2	-	X	X	X
74	Oxygen 1-2	X	X	X	X
75	Sensor current 1-2	-	X	X	X

76	Temp 1-3	X	X	X	X
77	pH 1-3	X	X	X	X
78	ORP 1-3	X	X	X	X
79	rH 1-3	X	X	X	X
80	Sensor mV1 1-3	-	X	X	X
81	Sensor mV2 1-3	-	X	X	X
82	Sensor mV3 1-3	-	X	X	X
83	Conduct1 1-3	X	X	X	X
84	Conduct2 1-3	X	X	X	X
85	Resist1 1-3	X	X	X	X
86	Resist2 1-3	X	X	X	X
87	Concent1 1-3	X	X	X	X
88	Concent2 1-3	X	X	X	X
89	USP 1-3	-	X	X	X
90	Sensor Ohms 1-3	-	X	X	X
91	Oxygen 1-3	X	X	X	X
92	Sensor current 1-3	-	X	X	X

93	Temp 1-4	X	X	X	X
94	pH 1-4	X	X	X	X
95	ORP 1-4	X	X	X	X
96	rH 1-4	X	X	X	X
97	Sensor mV1 1-4	-	X	X	X
98	Sensor mV2 1-4	-	X	X	X
99	Sensor mV3 1-4	-	X	X	X
100	Conduct1 1-4	X	X	X	X
101	Conduct2 1-4	X	X	X	X
102	Resist1 1-4	X	X	X	X
103	Resist2 1-4	X	X	X	X
104	Concent1 1-4	X	X	X	X
105	Concent2 1-4	X	X	X	X
106	USP 1-4	-	X	X	X
107	Sensor Ohms 1-4	-	X	X	X
108	Oxygen 1-4	X	X	X	X
109	Sensor current 1-4	-	X	X	X

X: configurable
-: not configurable
*1: Only (NaN) is displayed currently.
*2: DO70G/DO71/DO72 only support Oxygen. Sensor current is a fixed value (NaN)

FLXA402 use the following extended Units code for each unit

Unit	Unit Code
rH	240
S/m	241
µS/m	242
S/cm	243
Ohm m	244
MOhm m	245
%SAT	247

1.2.4 Diagnostics Command (Command 48)

HART Status Group	CMD48 byte	bit	HART Alarm Name (*2)	Alarm Number	NE107 *1
Device Status	-	0	PV Out of Limit	-	S
		1	Non-PV Out of Limit	-	S
		2	Loop Current Saturated	-	S
		3	Loop Current Fixed	-	N
		4	More Status Available	-	N
		5	Cold Start	-	N
		6	Configuration Changed	-	N
		7	Device Malfunction	-	N
Device Specific Status 0	0	0	Hardware failure	001	F
		1	Internal com. error	002	F
		2	IO mod. param. read error	003	F
		3	Com. mod. param. read error	004	F
		4	CPU param. read error	005	F
		5	Reserved	006	N
		6	Reserved	007	N
		7	Reserved	008	N
Device Specific Status 1	1	0	VGB calc. error	009	F
		1	Ratio calc. error	010	F
		2	Passage calc. error	011	F
		3	Rejection calc. error	012	F
		4	Deviation calc. error	013	F
		5	Script error	014	N
		6	Reserved	015	N
		7	Reserved	016	N
Device Specific Status 2	2	0	mA1 output burn out	017	F
		1	mA2 output burn out	018	F
		2	mA3 output burn out	019	F
		3	mA4 output burn out	020	F
		4	mA1 saturation	021	S
		5	mA2 saturation	022	S
		6	mA3 saturation	023	S
		7	mA4 saturation	024	S
Device Specific Status 3	3	0	AI exceeds limit	025	S
		1	AI out of range	026	F
		2	Expiry time exceeded	027	M
		3	Reserved		N
		4	Wash response failure	029	M
		5	Reserved		N
		6	Converter Error Simulation	031	C
		7	Fail safe occur	032	F

*1: F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
*2: “Reserved” is fixed 0.

HART Status Group	CMD48 byte	bit	HART Alarm Name (*2)	Alarm Number	NE107 *1
Device Specific Status 4	4	0	Simulated mA value 1	033	C
		1	Simulated mA value 2	034	C
		2	Simulated mA value 3	035	C
		3	Simulated mA value 4	036	C
		4	Outputs in HOLD1	037	N
		5	Outputs in HOLD2	038	N
		6	Outputs in HOLD3	039	N
		7	Outputs in HOLD4	040	N
Device Specific Status 5	5	0	Output configuration error	041	F
		1	Other configuration error	042	C
		2	Reserved	043	N
		3	Reserved	044	N
		4	Reserved	045	N
		5	Reserved	046	N
		6	Reserved	047	N
		7	Reserved	048	N
Extended Device Status	6	0	Maintenance Required(NE107: M)	-	N
		1	Device Variable Alert	-	S
		2	Critical Poew Failure		F
		3	Failure (NE107: F)	-	N
		4	Out of Specification (NE107: S)	-	N
		5	Function Check (NE107: C)	-	N
		6	Reserved		N
		7	Reserved		N
Device Operationg Mode	7	0	Reserved		N
		1	Reserved		N
		2	Reserved		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Standardized Status0	8	0	Device Variable Simulation Active		C
		1	Non-Volatile Memory Defect		F
		2	Volatile Memory Defect		F
		3	Watchdog Reset Executed		F
		4	Power Supply Conditions Out of Range		S
		5	Environmental Conditions Out of Range		S
		6	Electronic Defect		F
		7	Device Configuration Locked	-	N
Standardized Status1	9	0	Status Simulation Active	-	N
		1	Discrete Variable Simulation Active	-	C
		2	Event Notification Overflow		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Analog Channel Saturated	10	0	Analog Channel 1		N
		1	Analog Channel 2		N
		2	Analog Channel 3		N
		3	Analog Channel 4		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N

*1: F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
*2: “Reserved” is fixed 0.

HART Status Group	CMD48 byte	bit	HART Alarm Name (*2)	Alarm Number	NE107 *1
Standardized Status2	11	0	Sub-Device List Changed		N
		1	Duplicate master Detected.		N
		2	Reserved		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Standardized Status2 for Wireless HART	12	0	Reserved		N
		1	Reserved		N
		2	Reserved		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Analog Channel Fixed	13	0	Analog Channel 1		N
		1	Analog Channel 2		N
		2	Analog Channel 3		N
		3	Analog Channel 4		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Device Specific Status 6	14	0	Sensor 1-1 device failure	101	F
		1	Sensor 1-2 device failure	201	F
		2	Sensor 1-3 device failure	301	F
		3	Sensor 1-4 device failure	401	F
		4	Sensor 2-1 device failure	501	F
		5	Reserved	601	N
		6	Reserved	701	N
		7	Reserved	801	N
Device Specific Status 7	15	0	Sensor 1-1 configuration error	102	F
		1	Sensor 1-2 configuration error	202	F
		2	Sensor 1-3 configuration error	302	F
		3	Sensor 1-4 configuration error	402	F
		4	Sensor 2-1 configuration error	502	F
		5	Reserved	602	N
		6	Reserved	702	N
		7	Reserved	802	N
Device Specific Status 8	16	0	Temp. 1-1 exceeds user limit	103	S
		1	Temp. 1-2 exceeds user limit	203	S
		2	Temp. 1-3 exceeds user limit	303	S
		3	Temp. 1-4 exceeds user limit	403	S
		4	Temp. 2-1 exceeds user limit	503	S
		5	Reserved	603	N
		6	Reserved	703	N
		7	Reserved	803	N
Device Specific Status 9	17		Process 1-1 exceeds user limit	104	S
		1	Process 1-2 exceeds user limit	204	S
		2	Process 1-3 exceeds user limit	304	S
		3	Process 1-4 exceeds user limit	404	S
		4	Process 2-1 exceeds user limit	504	S
		5	Reserved	604	N
		6	Reserved	704	N
		7	Reserved	804	N

*1: F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
*2: “Reserved” is fixed 0.

HART Status Group	CMD48 byte	bit	HART Alarm Name (*2)	Alarm Number	NE107 *1
Device Specific Status 10	18	0	Sensor 1-1 measurement warning	105	N
		1	Sensor 1-2 measurement warning	205	N
		2	Sensor 1-3 measurement warning	305	N
		3	Sensor 1-4 measurement warning	405	N
		4	Sensor 2-1 measurement warning	505	N
		5	Reserved	605	N
		6	Reserved	705	N
		7	Reserved	805	N
Device Specific Status 11	19	0	Sensor 1-1 out of spec.	106	S
		1	Sensor 1-2 out of spec.	206	S
		2	Sensor 1-3 out of spec.	306	S
		3	Sensor 1-4 out of spec.	406	S
		4	Sensor 2-1 out of spec.	506	S
		5	Reserved	606	N
		6	Reserved	706	N
		7	Reserved	806	N
Device Specific Status 12	20	0	Sensor 1-1 warning	107	N
		1	Sensor 1-2 warning	207	N
		2	Sensor 1-3 warning	307	N
		3	Sensor 1-4 warning	407	N
		4	Sensor 2-1 warning	507	N
		5	Reserved	607	N
		6	Reserved	707	N
		7	Reserved	807	N
Device Specific Status 13	21	0	Sensor 1-1 disable	108	F
		1	Sensor 1-2 disable	208	F
		2	Sensor 1-3 disable	308	F
		3	Sensor 1-4 disable	408	F
		4	Sensor 2-1 disable	508	F
		5	Reserved	608	N
		6	Reserved	708	N
		7	Reserved	808	N
Device Specific Status 14	22	0	Reserved		N
		1	Reserved		N
		2	Reserved		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Device Specific Status 15	23	0	Reserved		N
		1	Reserved		N
		2	Reserved		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N
Device Specific Status 16	24	0	Reserved		N
		1	Reserved		N
		2	Reserved		N
		3	Reserved		N
		4	Reserved		N
		5	Reserved		N
		6	Reserved		N
		7	Reserved		N

*1: F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
*2: “Reserved” is fixed 0.

1.3 Precaution

- **Setting on the FLXA402 and a setup tool**

  HART/MODBUS network/the panel operation, they cannot be established simultaneously to change the setting of FLXA402.

  During the panel operation or the setting via MODBUS network, establishing HART connection issues a fail.

  We recommend mA output to be on Manual Hold status while you are changing the setting.

  See 3.7 Hold operation (manual Hold) on IM 12A01F01-03EN Operation of Converter.

- **Access to parameters (Printout, Up/Download of parameters)**

  The large number of parameters are configured in FLXA402. Therefore, it may take several minutes to carry our operation by using a lot of parameters.

- **Note on Display**

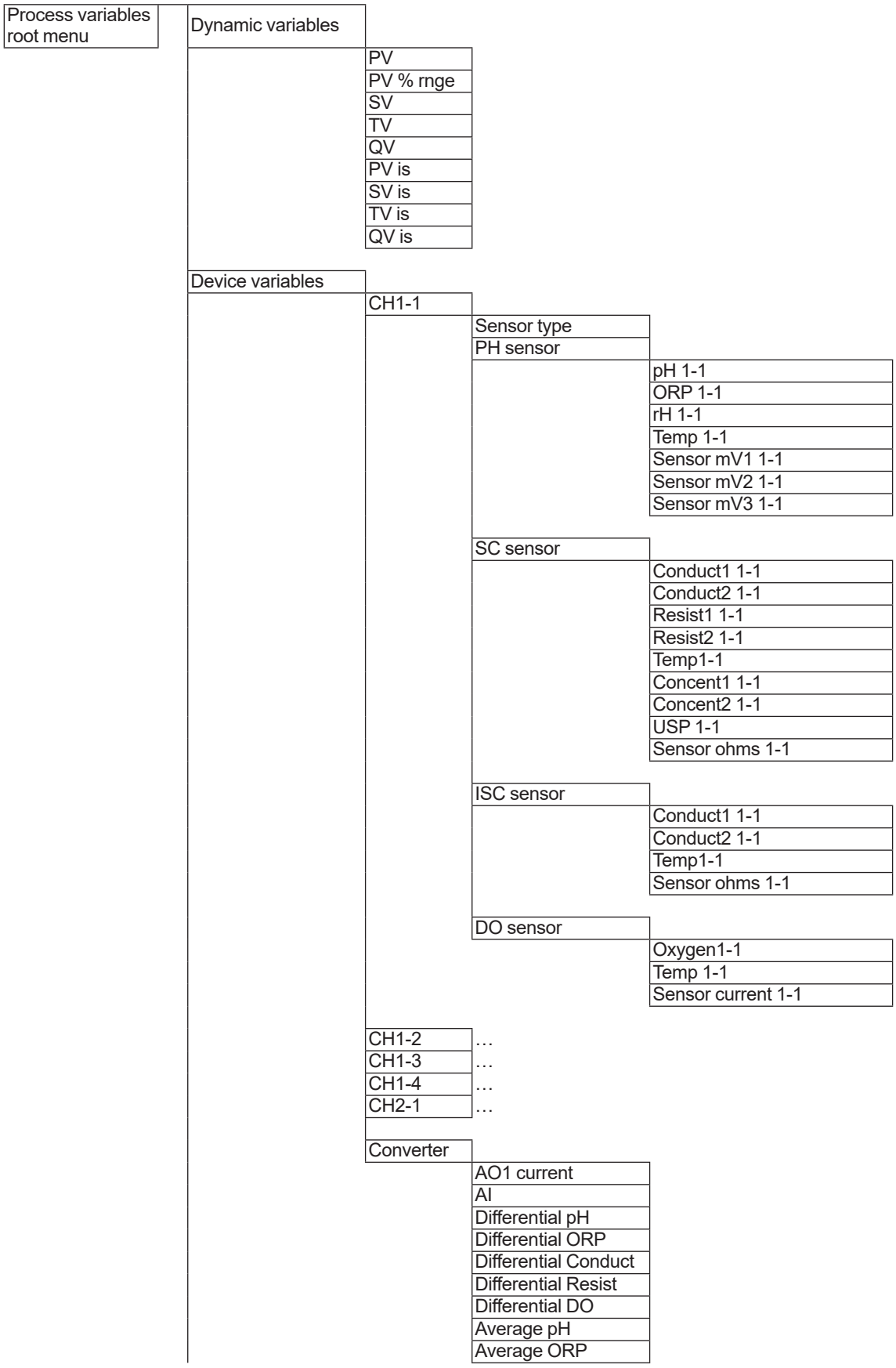
  Update the menu display whenever the setting of FLXA402 is revised.

2. DD Menu Structure (Device revision 1, DD revision 1)

2.1 Online menu

process_variables_root_menu
device_root_menu
diagnostic_root_menu
maintenance_root_menu

2.1.1 process_variables_root_menu



- Average Conduct
- Average Resist
- Average DO
- Ratio
- Passage
- Rejection
- Deviation
- pH calc
- Script 1
- Script 2
- Script 3
- Script 4
- Script 5
- Script 6
- Script 7
- Script 8

Dynamic variables status

- PV quality
- PV limit
- SV quality
- SV limit
- TV quality
- TV limit
- QV quality
- QV limit

Device variables status

CH1-1

PH sensor

- pH 1-1 quality
- pH 1-1 limit
- ORP 1-1 quality
- ORP 1-1 limit
- rH 1-1 quality
- rH 1-1 limit
- Temp 1-1 quality
- Temp 1-1 limit
- Sensor mV1 1-1 quality
- Sensor mV1 1-1 limit
- Sensor mV2 1-1 quality
- Sensor mV2 1-1 limit
- Sensor mV3 1-1 quality
- Sensor mV3 1-1 limit

SC sensor

- Conduct1 1-1 quality
- Conduct1 1-1 limit
- Conduct2 1-1 quality
- Conduct2 1-1 limit
- Resist1 1-1 quality
- Resist1 1-1 limit
- Resist2 1-1 quality
- Resist2 1-1 limit
- Temp 1-1 quality
- Temp 1-1 limit
- Concent1 1-1 quality
- Concent1 1-1 limit
- Concent2 1-1 quality
- Concent2 1-1 limit
- USP 1-1 quality

- USP 1-1 limit
- Sensor Ohms 1-1 quality
- Sensor Ohms 1-1 limit
- ISC sensor
  - Conduct1 1-1 quality
  - Conduct1 1-1 limit
  - Conduct2 1-1 quality
  - Conduct2 1-1 limit
  - Temp 1-1 quality
  - Temp 1-1 limit
  - Sensor Ohms 1-1 quality
  - Sensor Ohms 1-1 limit
- DO sensor
  - Oxygen 1-1 quality
  - Oxygen 1-1 limit
  - Temp 1-1 quality
  - Temp 1-1 limit
  - Sensor current 1-1 quality
  - Sensor current 1-1 limit

CH1-2 …
CH1-3 …
CH1-4 …
CH2-1 …

Converter
- AO1 current quality
- AO1 current limit
- AI quality
- AI limit
- Differential pH quality
- Differential pH limit
- Differential ORP quality
- Differential ORP limit
- Differential Conduct quality
- Differential Conduct limit
- Differential Resist quality
- Differential Resist limit
- Differential DO quality
- Differential DO limit
- Average pH quality
- Average pH limit
- Average ORP quality
- Average ORP limit
- Average Conduct quality
- Average Conduct limit
- Average Resist quality
- Average Resist limit
- Average DO quality
- Average DO limit
- Ratio quality
- Ratio limit
- Passage quality

- Passage limit
- Rejection quality
- Rejection limit
- Deviation quality
- Deviation limit
- pH calc quality
- pH calc limit
- Script 1 quality
- Script 1 limit
- Script 2 quality
- Script 2 limit
- Script 3 quality
- Script 3 limit
- Script 4 quality
- Script 4 limit
- Script 5 quality
- Script 5 limit
- Script 6 quality
- Script 6 limit
- Script 7 quality
- Script 7 limit
- Script 8 quality
- Script 8 limit

- View input/output
  - AO1 current
  - AO2 current
  - AO3 current
  - AO4 current
  - AI current
  - Contact in/out
- Sensor variables
  - CH1-1
    - PH sensor
      - IMP1 1-1
      - IMP2 1-1
      - Sensor mV1 1-1
      - Sensor mV2 1-1
      - Sensor mV3 1-1
    - SC sensor
      - Sensor Ohms 1-1
      - Polarization 1-1
    - ISC sensor
      - Sensor Ohms 1-1
    - DO sensor
      - Sensor current 1-1
      - Polarization voltage 1-1
      - Available KOH 1-1
      - Pressure level (process)
  - CH1-2 …
  - CH1-3 …
  - CH1-4 …
  - CH2-1 …
- User select
  - User select values
    - [selected device variable name]
    - [selected device variable name]
    - [selected device variable name]

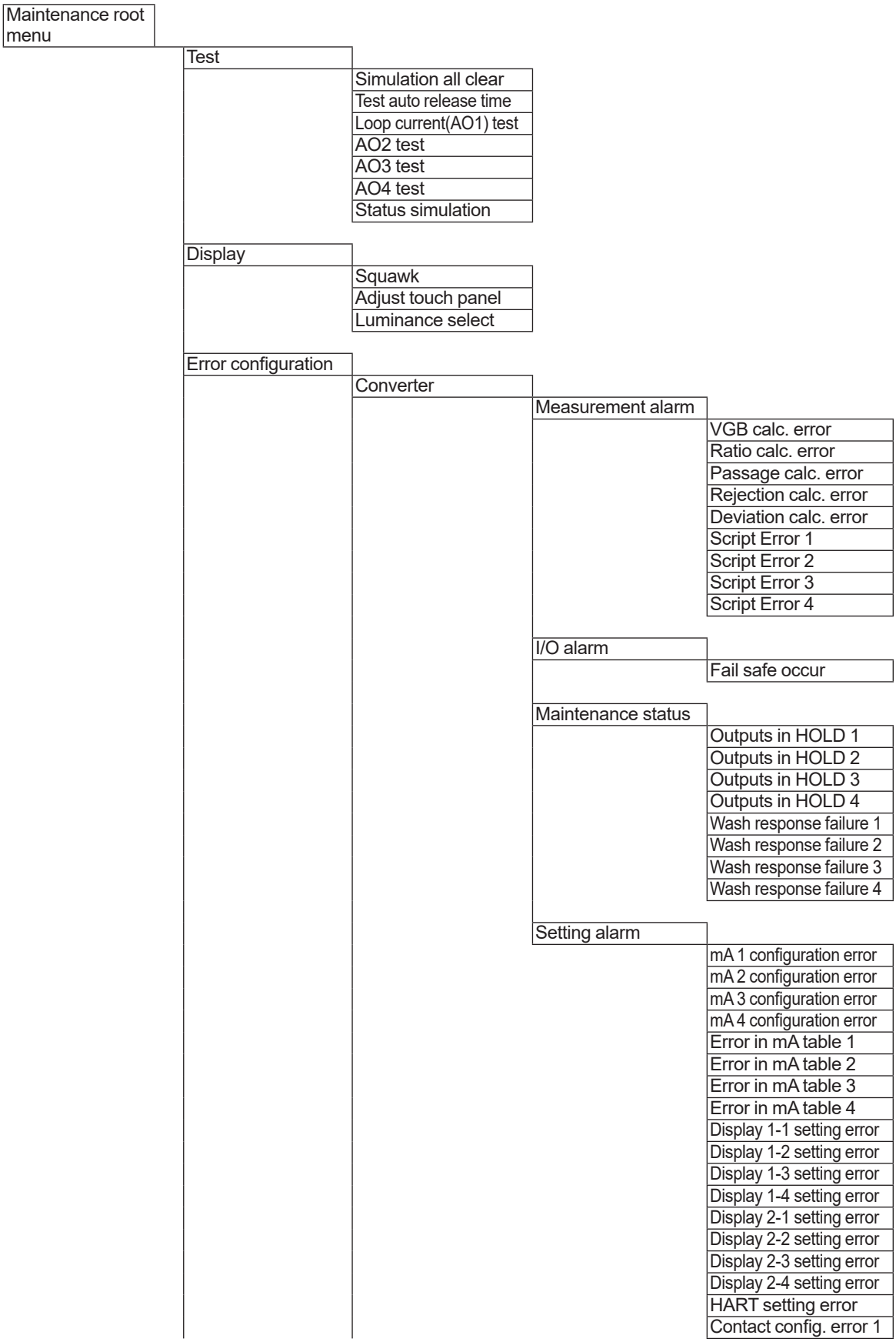
- [selected device variable name]
- [selected device variable name]
- [selected device variable name]
- [selected device variable name]
- [selected device variable name]

- User select codes
  - User select code 1
  - User select code 2
  - User select code 3
  - User select code 4
  - User select code 5
  - User select code 6
  - User select code 7
  - User select code 8

2.1.2 diagnostic_root_menu

- Diagnostics root menu
  - Device status
    - Device Status
    - Extended Device Status
    - Standardized Status 0
    - Standardized Status 1
    - Device Specific Status 0
    - Device Specific Status 1
    - Device Specific Status 2
    - Device Specific Status 3
    - Device Specific Status 4
    - Device Specific Status 5
    - Device Specific Status 6
    - Device Specific Status 7
    - Device Specific Status 8
    - Device Specific Status 9
    - Device Specific Status 10
    - Device Specific Status 11
    - Device Specific Status 12
    - Device Specific Status 13
    - Config changed count
    - Clear config changed flag
  - Detailed device status
    - CH1-1
      - PH sensor
      - SC sensor
      - ISC sensor
      - DO sensor
    - CH1-2 …
    - CH1-3 …
    - CH1-4 …
    - CH2-1 …
    - Converter

2.1.3 maintenance_root_menu



- Contact config. error 2
- Contact config. error 3
- Contact config. error 4
- PH sensor
  - Sensor status
    - Sensor not detect
    - Temp element not detect
    - ID chip failure
    - LE detect
    - calibration due
    - imp1 glasbreak detect
    - imp2 glasbreak detect
  - Measurement warning
    - temp too high
    - temp too low
    - pH too high
    - pH too low
    - ORP too high
    - ORP too low
    - rH too high
    - rH too low
    - imp(pH/ORP) too high
    - imp(pH/ORP) too low
    - imp(ref) too high
    - imp(ref) too low
    - pH temp comp warning
    - SSA temp out. Operating spec
  - Device status
    - SENCOM Comm. Error
- SC sensor
  - Sensor status
    - Sensor not detect
    - Temp element not detect
    - ID chip failure
    - calibration due
  - Measurement warning
    - temp too high
    - temp too low
    - conductivity too high
    - conductivity too low
    - temp comp1 warning
    - temp comp2 warning
    - USP limit exceeded
    - USP margin exceeded
    - Polarization detected
    - matrix1 error
    - matrix2 error
    - conc table error
    - SSA temp out. Operating spec
  - Device status
    - SENCOM Comm. Error
- ISC sensor
  - Sensor status

- Sensor not detect
- Temp element not detect
- ID chip failure
- calibration due
- Measurement warning
  - temp too high
  - temp too low
  - conductivity too high
  - conductivity too low
  - temp comp1 warning
  - temp comp2 warning
  - matrix1 error
  - matrix2 error
  - conc table error
  - SSA temp out. Operating spec
- Device status
  - SENCOM Comm. Error

DO sensor

- Sensor status
  - Sensor not detect
  - Temp element not detect
  - ID chip failure
  - sensor membrane failure
  - calibration due
- Measurement warning
  - temp too high
  - temp too low
  - DO too high
  - DO too low
  - SSA temp out. Operating spec
- Device status
  - SENCOM Comm. Error

Condensed status map

Device status

- Primary Variable Out of Limits
- Non-Primary Variable Out of Limits
- Loop Current Saturated
- Loop Current Fixed
- More Status Available
- Cold Start
- Configuration Changed
- Device Malfunction

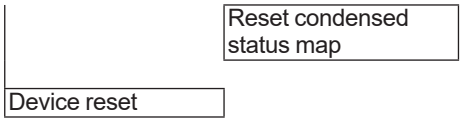
Ext dev status

- Maintenance required
- Device variable alert
- Failure
- Out of Specification
- Function Check

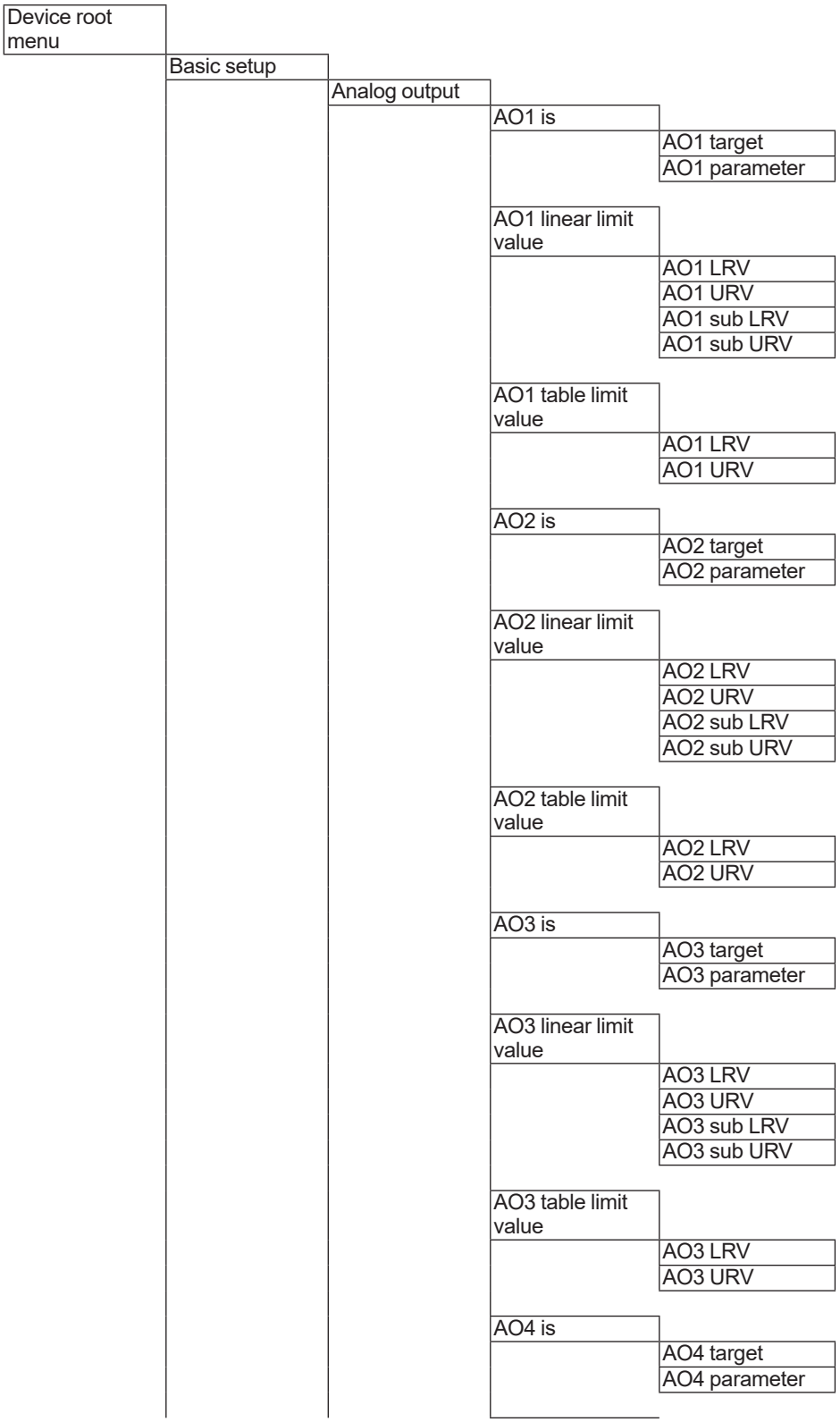
Device diagnostic status 0	
	Device configuration locked
Device diagnostic status 1	
	Status simulation active
	Discrete Variable Simulation active
Device Specific Status 0	
	Hardware failure
	Internal com. error
	IO mod. param. read error
	Com. mod. param. read error
	CPU param. read error
Device Specific Status 1	
	VGB calc. error
	Ratio calc. error
	Passage calc. error
	Rejection calc. error
	Deviation calc. error
	Script error
Device Specific Status 2	
	mA 1 output burn out
	mA 2 output burn out
	mA 3 output burn out
	mA 4 output burn out
	mA 1 saturation
	mA 2 saturation
	mA 3 saturation
	mA 4 saturation
Device Specific Status 3	
	AI exceeds limit
	AI out of range
	Expiry time exceeded
	Wash response failure
	Converter Error Simulation
	Fail safe occur
Device Specific Status 4	
	Simulated mA value 1
	Simulated mA value 2
	Simulated mA value 3
	Simulated mA value 4
	Outputs in HOLD1
	Outputs in HOLD2
	Outputs in HOLD3
	Outputs in HOLD4

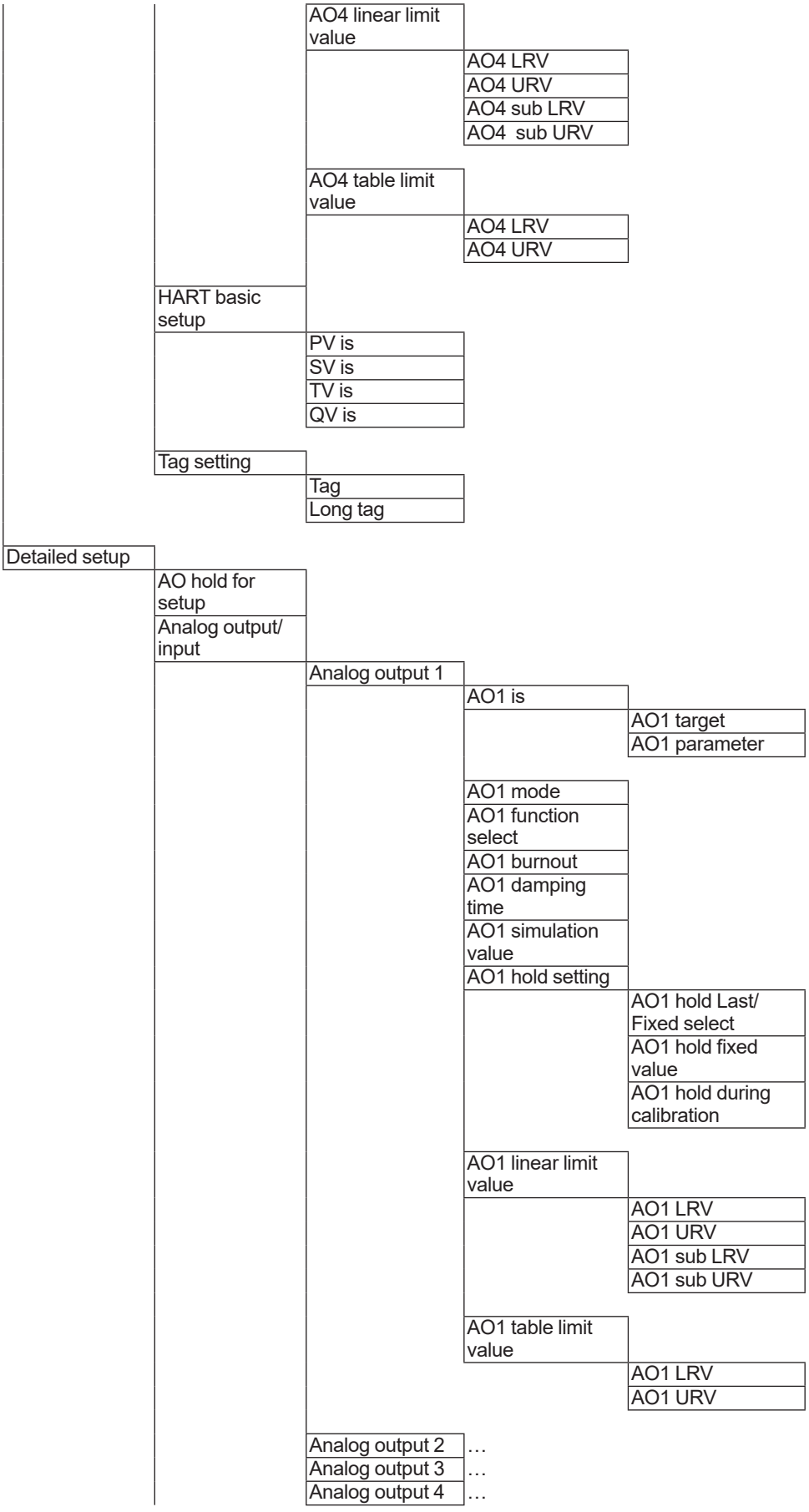
Device Specific Status 5	
	Output configuration error
	Other configuration error
Device Specific Status 6	
	Sensor 1-1 device failure
	Sensor 1-2 device failure
	Sensor 1-3 device failure
	Sensor 1-4 device failure
	Sensor 2-1 device failure
	Sensor 2-2 device failure
	Sensor 2-3 device failure
	Sensor 2-4 device failure
Device Specific Status 7	
	Sensor 1-1 configuration error
	Sensor 1-2 configuration error
	Sensor 1-3 configuration error
	Sensor 1-4 configuration error
	Sensor 2-1 configuration error
	Sensor 2-2 configuration error
	Sensor 2-3 configuration error
	Sensor 2-4 configuration error
Device Specific Status 8	
	Temp. 1-1 exceeds user limit
	Temp. 1-2 exceeds user limit
	Temp. 1-3 exceeds user limit
	Temp. 1-4 exceeds user limit
	Temp. 2-1 exceeds user limit
	Temp. 2-2 exceeds user limit
	Temp. 2-3 exceeds user limit
	Temp. 2-4 exceeds user limit
Device Specific Status 9	
	Process 1-1 exceeds user limit
	Process 1-2 exceeds user limit
	Process 1-3 exceeds user limit

	Process 1-4 exceeds user limit
	Process 2-1 exceeds user limit
	Process 2-2 exceeds user limit
	Process 2-3 exceeds user limit
	Process 2-4 exceeds user limit
Device Specific Status 10	
	Sensor 1-1 measurement warning
	Sensor 1-2 measurement warning
	Sensor 1-3 measurement warning
	Sensor 1-4 measurement warning
	Sensor 2-1 measurement warning
	Sensor 2-2 measurement warning
	Sensor 2-3 measurement warning
	Sensor 2-4 measurement warning
Device Specific Status 11	
	Sensor 1-1 out of spec.
	Sensor 1-2 out of spec.
	Sensor 1-3 out of spec.
	Sensor 1-4 out of spec.
	Sensor 2-1 out of spec.
	Sensor 2-2 out of spec.
	Sensor 2-3 out of spec.
	Sensor 2-4 out of spec.
Device Specific Status 12	
	Sensor 1-1 warning
	Sensor 1-2 warning
	Sensor 1-3 warning
	Sensor 1-4 warning
	Sensor 2-1 warning
	Sensor 2-2 warning
	Sensor 2-3 warning
	Sensor 2-4 warning
Device Specific Status 13	
	Sensor 1-1 disable
	Sensor 1-2 disable
	Sensor 1-3 disable
	Sensor 1-4 disable
	Sensor 2-1 disable
	Sensor 2-2 disable
	Sensor 2-3 disable
	Sensor 2-4 disable



2.1.4 device_root_menu




AO4 linear limit value
AO4 LRV
AO4 URV
AO4 sub LRV
AO4 sub URV
AO4 table limit value
AO4 LRV
AO4 URV
HART basic setup
PV is
SV is
TV is
QV is
Tag setting
Tag
Long tag
Detailed setup
AO hold for setup
Analog output/ input
Analog output 1
AO1 is
AO1 target
AO1 parameter
AO1 mode
AO1 function select
AO1 burnout
AO1 damping time
AO1 simulation value
AO1 hold setting
AO1 hold Last/ Fixed select
AO1 hold fixed value
AO1 hold during calibration
AO1 linear limit value
AO1 LRV
AO1 URV
AO1 sub LRV
AO1 sub URV
AO1 table limit value
AO1 LRV
AO1 URV
Analog output 2 …
Analog output 3 …
Analog output 4 …

- Analog input
  - AI type
  - AI damping time
  - AI upper Limit
  - AI lower limit
  - AI temperature
    - AI temp unit
    - AI Temp LRV
    - AI Temp URV
  - AI pressure
    - AI press unit
    - AI Press LRV
    - AI Press URV
    - Pressure comp. (DO70G/DO71/DO72)
- Contact input
  - Contact input 1
    - DI1 type
    - DI1 wash target
    - DI1 change range target
  - Contact input 2
    - DI2 type
    - DI2 wash target
    - DI2 change range target
- Display setup
  - Auto return time select
  - Luminance select
  - Backlight auto off time select
  - Squawk setting
- Device information
  - Date/Time
    - Current date
    - Current time
  - Serial No.
  - Software rev
  - Internal serial No.
    - Housing assy
    - mA output module
    - Communication module
    - Analog sensor module 1
    - Analog sensor module 2
- Sensor information
- HART detailed setup

*The rest of this is displayed on the different area.

- HART output
  - PV is
  - SV is
  - TV is

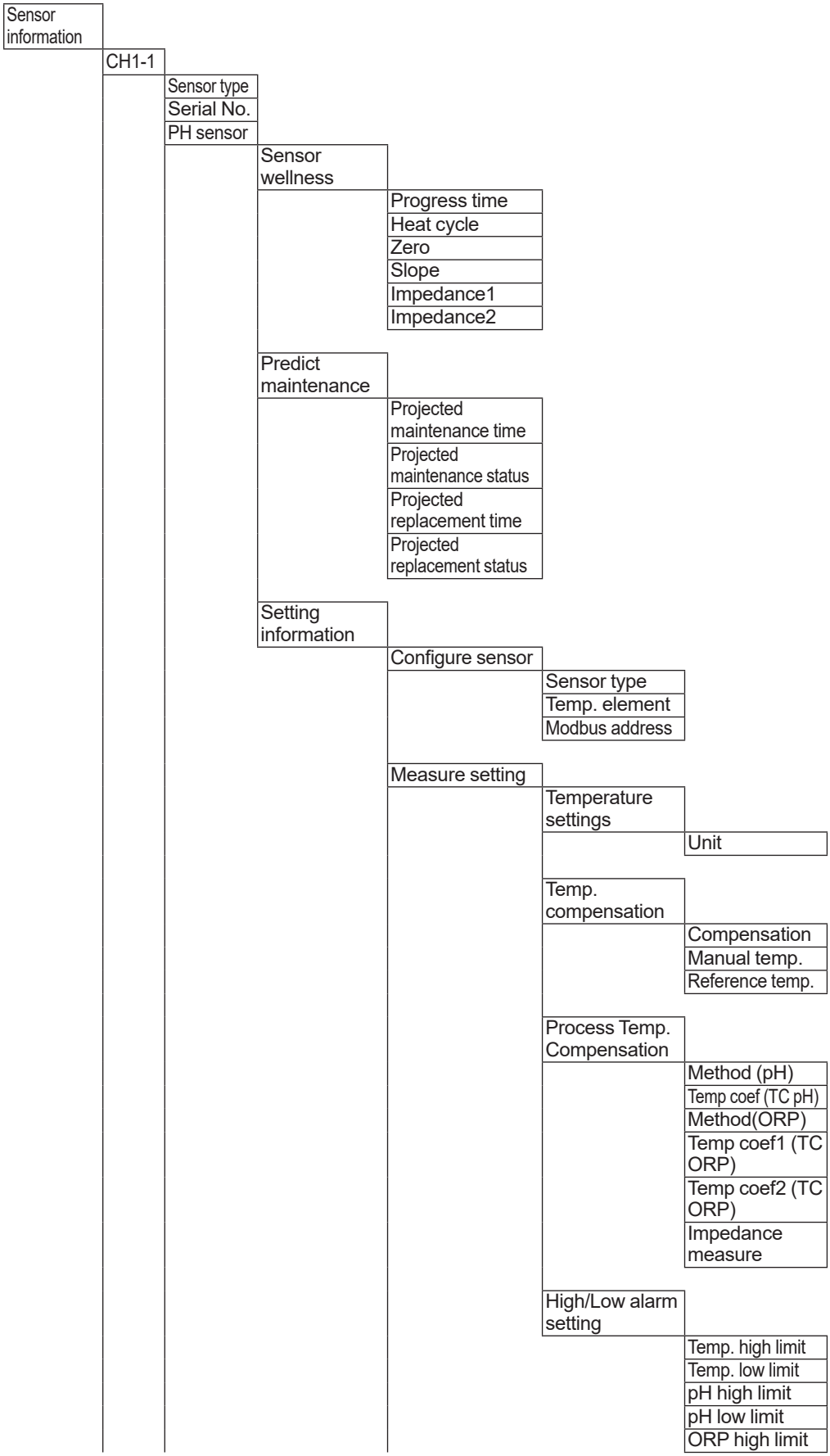
- QV is
- Loop current mode
- Poll addr

- HART identification
  - Tag
  - Long tag
  - Num req preams
  - Num resp preams
  - Descriptor
  - Message
  - Date
  - Final asembly num
  - Distributor
  - Model
  - Write protect
  - STX Count
  - ACK Count

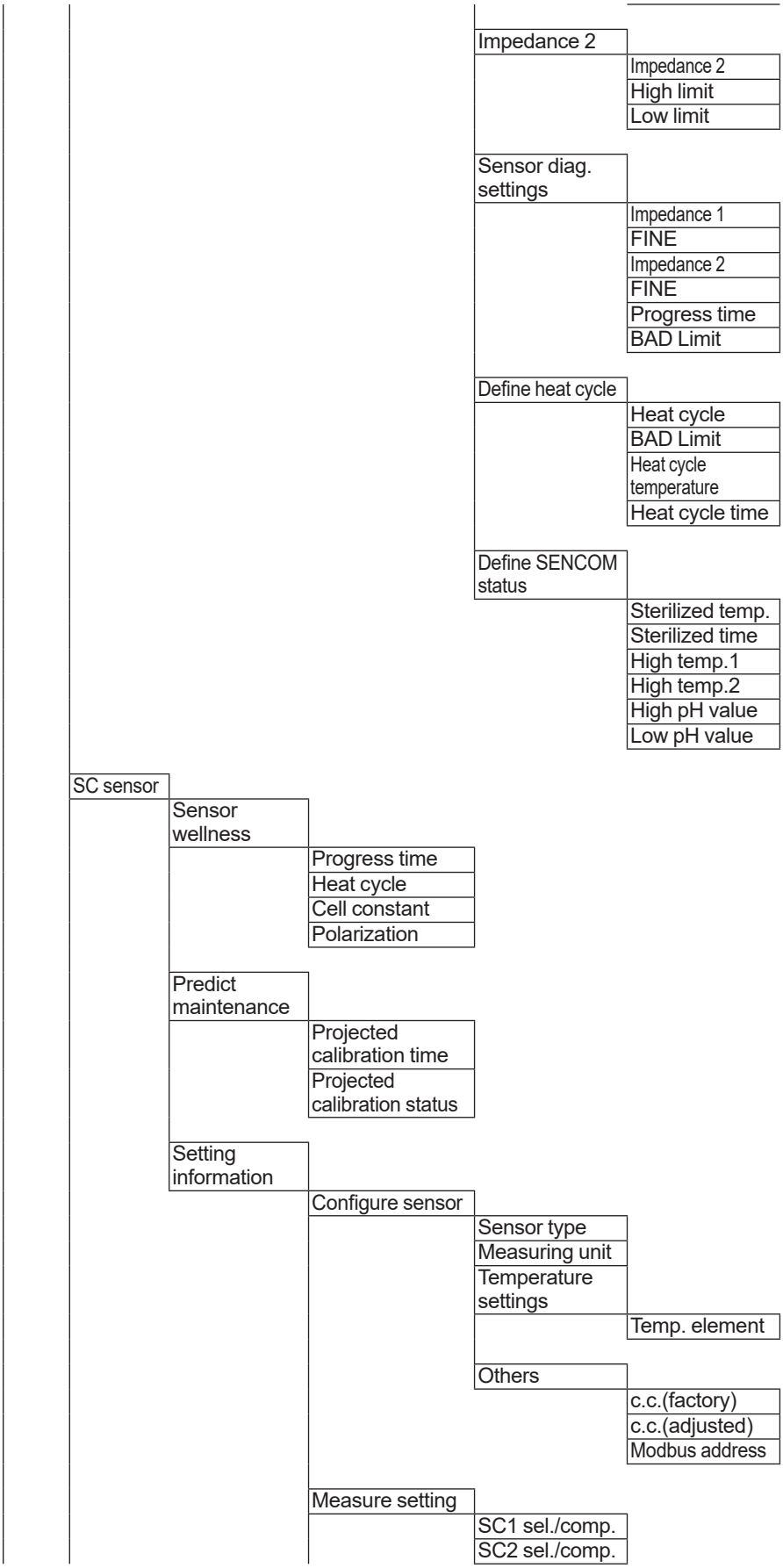
- HART sub unit setup
  - Sub unit select
    - Sensor 1-1 subunit enable
    - Sensor 1-2 subunit enable
    - Sensor 1-3 subunit enable
    - Sensor 1-4 subunit enable
    - Sensor 2-1 subunit enable
    - Sensor 2-2 subunit enable
    - Sensor 2-3 subunit enable
    - Sensor 2-4 subunit enable

- HART revisions
  - Fld dev rev
  - Dev id
  - Universal rev
  - Software rev
  - Hardware rev

* **The rest of the Sensor information**



- ORP low limit
- rH high limit
- rH low limit
- Calibration settings
  - Temp offset
  - Stabilization time
  - Calibr. Interval
  - Cal. set pH
    - Unit
      - Zero unit
      - Slope unit
    - Limits and timing
      - zero high limit
      - zero low limit
      - slope high limit
      - slope low limit
      - Step Range
    - Buffers (select set)
      - Select Buffer
    - Zero/Slope/ITP
      - Zero
      - Slope
      - ITP
      - Zero2
      - Slope2
  - Cal. set ORP/rH
    - Limits and timing
      - zero high limit
      - zero low limit
      - slope high limit
      - slope low limit
      - Step Range (ORP)
      - Step Range (rH)
    - zero/slope
      - Zero
      - Slope
    - zero/slope2
      - Zero
      - Slope
- Wellness settings
  - Impedance 1
    - Impedance 1
    - High limit
    - Low limit


Impedance 2
Impedance 2
High limit
Low limit
Sensor diag. settings
Impedance 1
FINE
Impedance 2
FINE
Progress time
BAD Limit
Define heat cycle
Heat cycle
BAD Limit
Heat cycle temperature
Heat cycle time
Define SENCOM status
Sterilized temp.
Sterilized time
High temp.1
High temp.2
High pH value
Low pH value
SC sensor
Sensor wellness
Progress time
Heat cycle
Cell constant
Polarization
Predict maintenance
Projected calibration time
Projected calibration status
Setting information
Configure sensor
Sensor type
Measuring unit
Temperature settings
Temp. element
Others
c.c.(factory)
c.c.(adjusted)
Modbus address
Measure setting
SC1 sel./comp.
SC2 sel./comp.

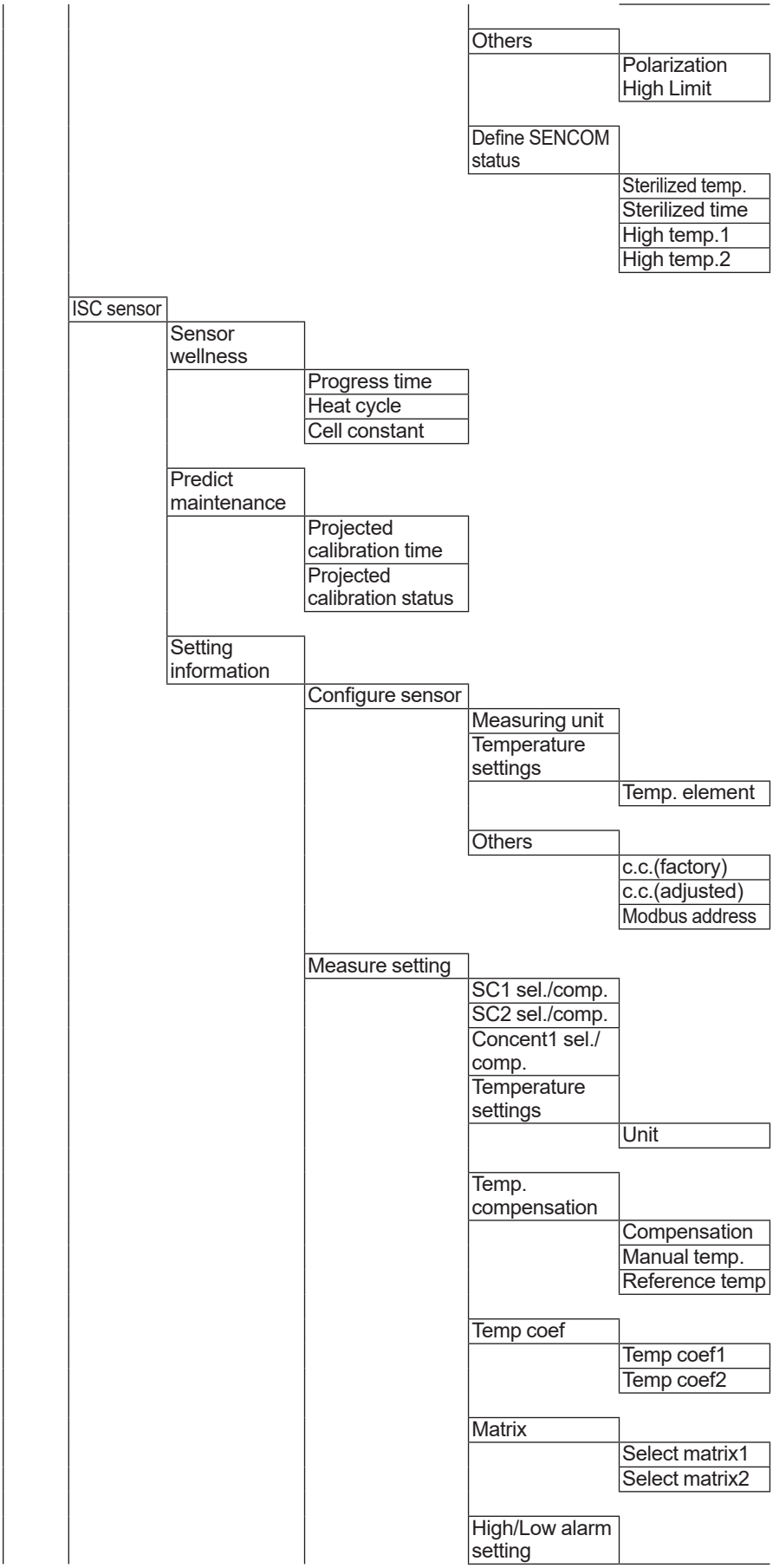
- Concent1 sel./ comp.
- Temperature settings
  - Unit
- Temp. compensation
  - Compensation
  - Manual temp.
  - Reference temp
- Temp coef
  - Temp coef1
  - Temp coef2
- Matrix
  - Select matrix1
  - Select matrix2
- High/Low alarm setting
  - Temperature High Limit
  - Temperature Low Limit
  - Conductivity High Limit
  - Conductivity Low Limit
  - Resistance High Limit
  - Resistance Low Limit
  - USP safety margin

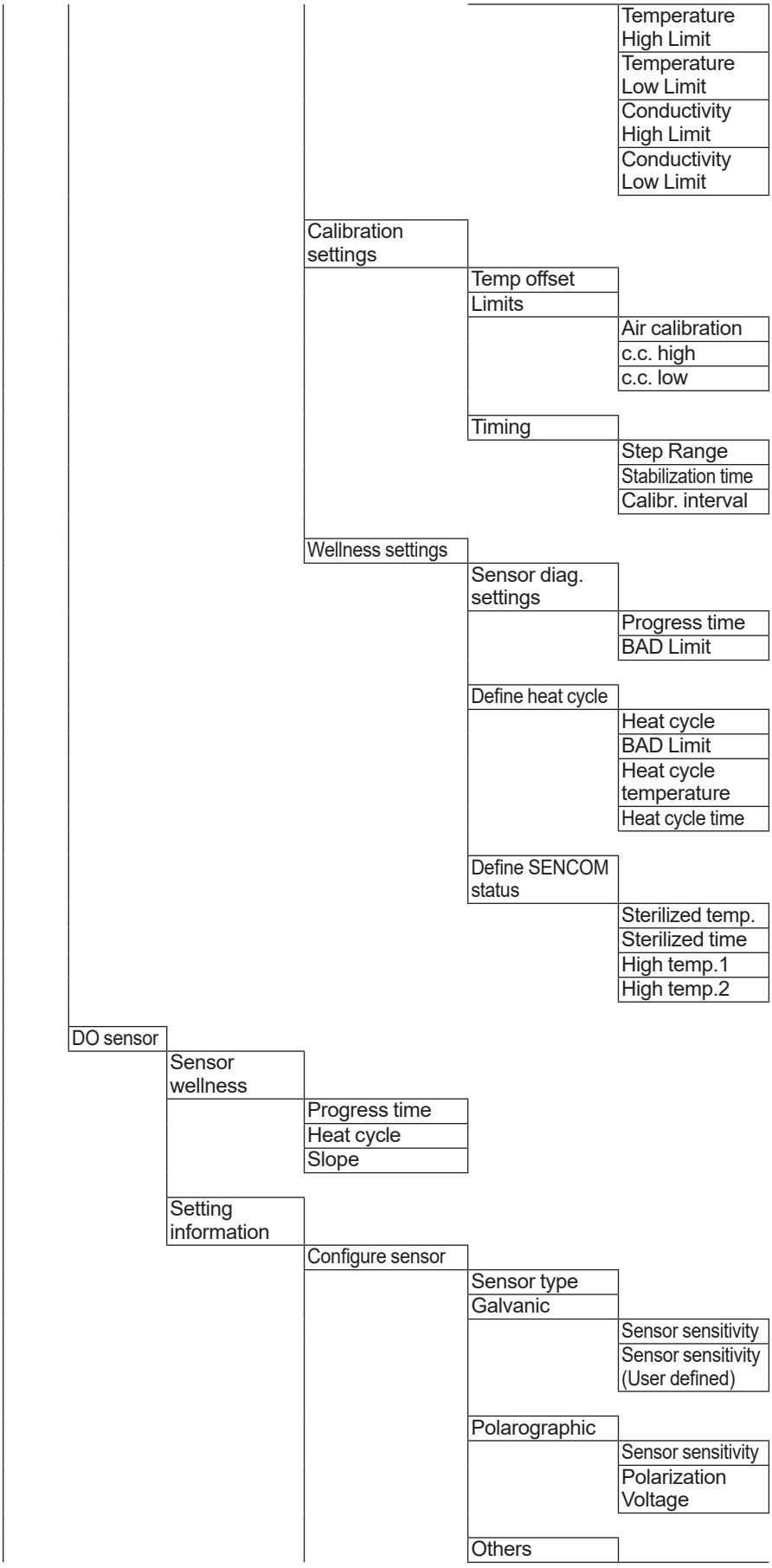
Calibration settings

- Temp offset
- Limits
  - Air calibration
  - c.c. high
  - c.c. low
- Timing
  - Step Range
  - Stabilization time
  - Calibr. interval

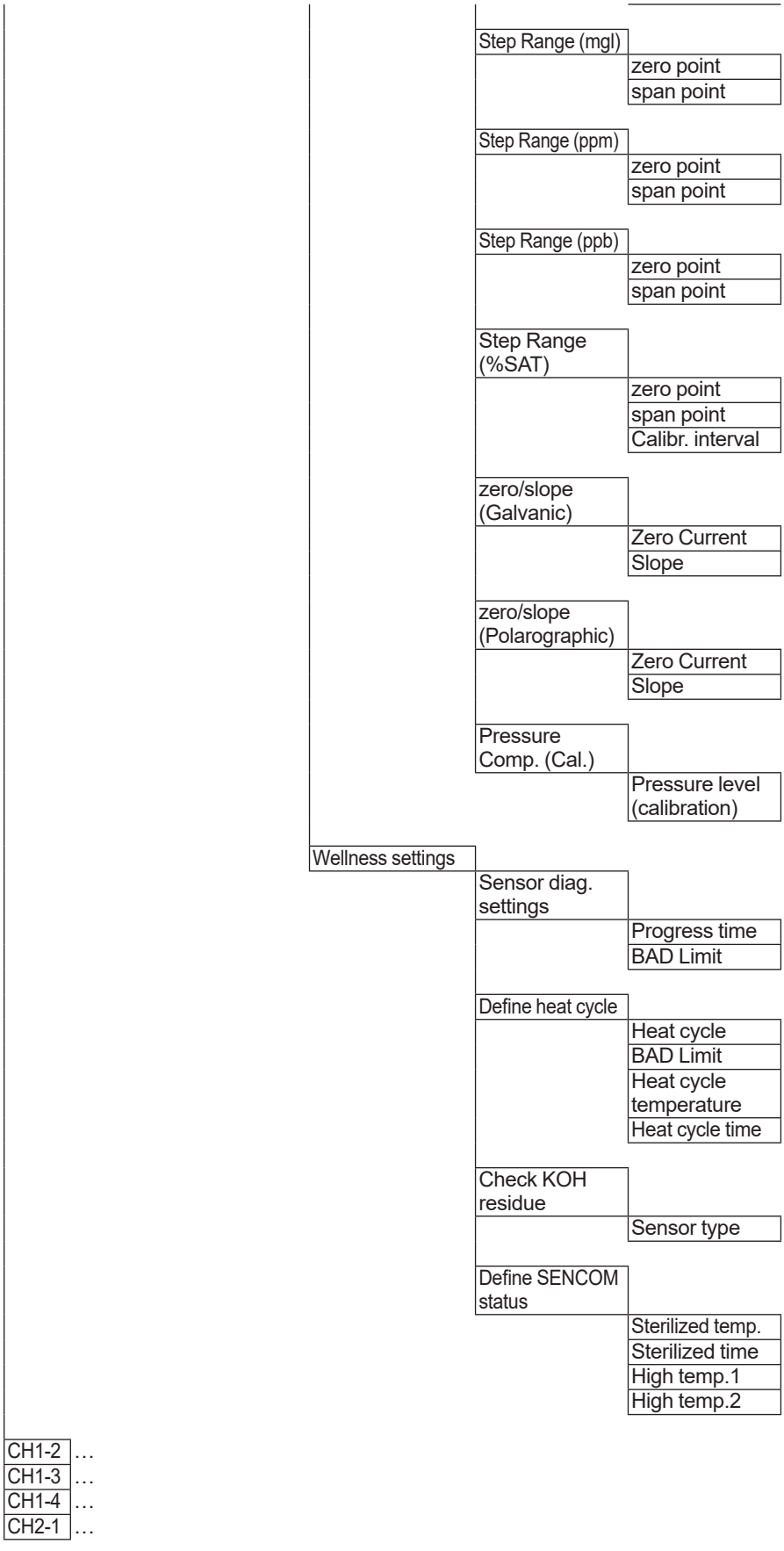
Wellness settings

- Sensor diag. settings
  - Progress time
  - BAD Limit
- Define heat cycle
  - Heat cycle
  - BAD Limit
  - Heat cycle temperature
  - Heat cycle time


Others
Polarization High Limit
Define SENCOM status
Sterilized temp.
Sterilized time
High temp.1
High temp.2
ISC sensor
Sensor wellness
Progress time
Heat cycle
Cell constant
Predict maintenance
Projected calibration time
Projected calibration status
Setting information
Configure sensor
Measuring unit
Temperature settings
Temp. element
Others
c.c.(factory)
c.c.(adjusted)
Modbus address
Measure setting
SC1 sel./comp.
SC2 sel./comp.
Concent1 sel./ comp.
Temperature settings
Unit
Temp. compensation
Compensation
Manual temp.
Reference temp
Temp coef
Temp coef1
Temp coef2
Matrix
Select matrix1
Select matrix2
High/Low alarm setting


Temperature High Limit
Temperature Low Limit
Conductivity High Limit
Conductivity Low Limit
Calibration settings
Temp offset
Limits
Air calibration
c.c. high
c.c. low
Timing
Step Range
Stabilization time
Calibr. interval
Wellness settings
Sensor diag. settings
Progress time
BAD Limit
Define heat cycle
Heat cycle
BAD Limit
Heat cycle temperature
Heat cycle time
Define SENCOM status
Sterilized temp.
Sterilized time
High temp.1
High temp.2
DO sensor
Sensor wellness
Progress time
Heat cycle
Slope
Setting information
Configure sensor
Sensor type
Galvanic
Sensor sensitivity
Sensor sensitivity (User defined)
Polarographic
Sensor sensitivity
Polarization Voltage
Others

- Temp. element
- Modbus address
- Measure setting
  - DO settings
    - Unit
  - Temperature settings
    - Unit
  - Temp. compensation
    - Compensation
    - Manual temp.
  - Salinity comp.
    - Compensation
    - Salinity
  - Pressure comp. (Measure)
    - Compensation
    - Pressure level (process)
    - Pressure unit
  - High/Low alarm setting
    - Temp. high limit
    - Temp. low limit
    - DO (mgl) high limit
    - DO (mgl) low limit
    - DO (ppm) high limit
    - DO (ppm) low limit
    - DO (ppb) high limit
    - DO (ppb) low limit
    - DO (%SAT) high limit
    - DO (%SAT) low limit
- Calibration settings
  - Temp offset
  - Limits and timing (Galvanic)
    - zero high limit
    - zero low limit
    - slope high limit
    - slope low limit
  - Limits and timing (Polarographic)
    - zero high limit
    - zero low limit
    - slope high limit
    - slope low limit
    - Stabilization time


Step Range (mgl)
zero point
span point
Step Range (ppm)
zero point
span point
Step Range (ppb)
zero point
span point
Step Range (%SAT)
zero point
span point
Calibr. interval
zero/slope (Galvanic)
Zero Current
Slope
zero/slope (Polarographic)
Zero Current
Slope
Pressure Comp. (Cal.)
Pressure level (calibration)
Wellness settings
Sensor diag. settings
Progress time
BAD Limit
Define heat cycle
Heat cycle
BAD Limit
Heat cycle temperature
Heat cycle time
Check KOH residue
Sensor type
Define SENCOM status
Sterilized temp.
Sterilized time
High temp.1
High temp.2
CH1-2 …
CH1-3 …
CH1-4 …
CH2-1 …

2.2 Offline

offline_root_menu

Tag
Long tag
Descriptor
Message
Date
Final asmbly num
Poll addr
Loop current mode
Num resp preams
Test auto release time
SV is
TV is
QV is
AO1 target
AO1 parameter
AO1 mode
AO1 function select
AO1 burnout
AO1 damping time
AO1 simulation value
AO1 hold Last/Fixed select
AO1 hold fixed value
AO1 hold during calibration
AO2 target
AO2 parameter
AO2 mode
AO2 function select
AO2 burnout
AO2 damping time
AO2 simulation value
AO2 hold Last/Fixed select
AO2 hold fixed value
AO2 hold during calibration
AO3 target
AO3 parameter
AO3 mode
AO3 function select
AO3 burnout
AO3 damping time
AO3 simulation value
AO3 hold Last/Fixed select
AO3 hold fixed value
AO3 hold during calibration
AO4 target
AO4 parameter
AO4 mode
AO4 function select
AO4 burnout
AO4 damping time
AO4 simulation value
AO4 hold Last/Fixed select
AO4 hold fixed value
AO4 hold during calibration
AI type
AI damping time

AI upper Limit
AI lower limit
AI Temp. LRV
AI Temp. URV
AI Press. LRV
AI Press. URV
Pressure comp.(DO70G/DO71/DO72)
DI1 type
DI1 wash target
DI1 change range target
DI2 type
DI2 wash target
DI2 change range target
Sub unit select
Auto return time select
Luminance select
Backlight auto off time select

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Manual number : TI 12A01F01-61EN

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