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This document describes HART communication by Zirconia Oxygen/Humidity Analyzer, Converter ZR802G/ZR802S.

Before communicating using the HART protocol for details of the parameters, refer to the User's Manual as follows:

ZR22G and ZR802G Zirconia Oxygen/Humidity Analyzer IM 11M12G01-02EN, or
ZR22S and ZR802S Explosion-proof Zirconia Oxygen Analyzer IM 11M13G01-02EN

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

<https://www.yokogawa.com/an/zr802/download/>



1. General

HART Communication superimposes specific waveforms called HART Communication waveforms on the 4–20 mA analog signal from a ZR802G/ZR802S to enable remote intercommunication between the online ZR802G/ZR802S 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 R3.04.10 + Device Files R3.09.13

HART is a registered trademark of FIELD COMM GROUP. <https://www.fieldcommgroup.org/>

1.1 Installing DD files

To enable HART communication between a ZR802G/ZR802S and setup tool, the device description (DD) file of the ZR802G/ZR802S needs to be installed in the setup tool. The DD file contains the HART communication details and menu configurations specific to the ZR802G/ZR802S.

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 ZR802G/ZR802S, FieldMate and DD file

ZR802G MAIN board		FieldMate
Software revision	Device revision	Revision of Device Files
1.01.01 or later	1	R3.09.13 or later

The software revision and the device revision are shown on the display of ZR802G/ZR802S Main or Home screen which is introduced by pressing the  Detail. (Figure 1)

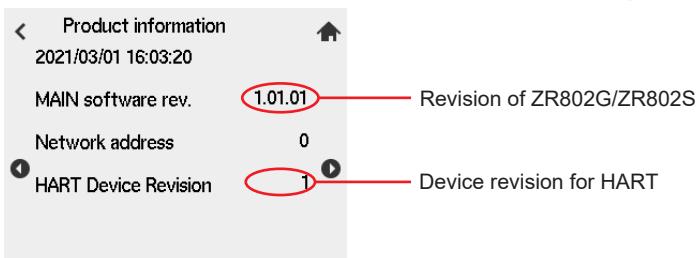


Figure 1 Software Revision

■ Installing DD File

For how to install the DD file, see the respective documentation for the setup tool you use.
For FieldMate R3.04.10+Device Files R3.09.13, installing DD File is not required.

■ Connecting Setup Tool

Connect HART modem at the both ends of the load resistance which is 250 to 550 ohms and is installed between the setup tool terminals and AO1.

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

The following functions are available from the DD menu of ZR802G/ZR802S.

Menu	Function
Process variables root menu	PConfirmation of measured values of PV, etc.
	Setup output range of PV, QV, AQ
	Calibration execution
	Blowback execution
Diagnostics root menu	Confirmation of Alarm status
	Loop check execution
	Simple cell resistance measurement
	Reboot the device
	Setup Condensed Status
Device root menu	Device settings
Maintenance root menu	Shortcut menus of already mentioned maintenance functions such as calibration

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, setup items as follows.

- **Loop current mode (parameter: Loop current mode)**

For Multi-drop connection: multiple number of field devices connect on a single HART cable, while requiring 4 mA fixed, set the parameter "Disabled". When only one device is connected on HART, keep the default "Enabled."

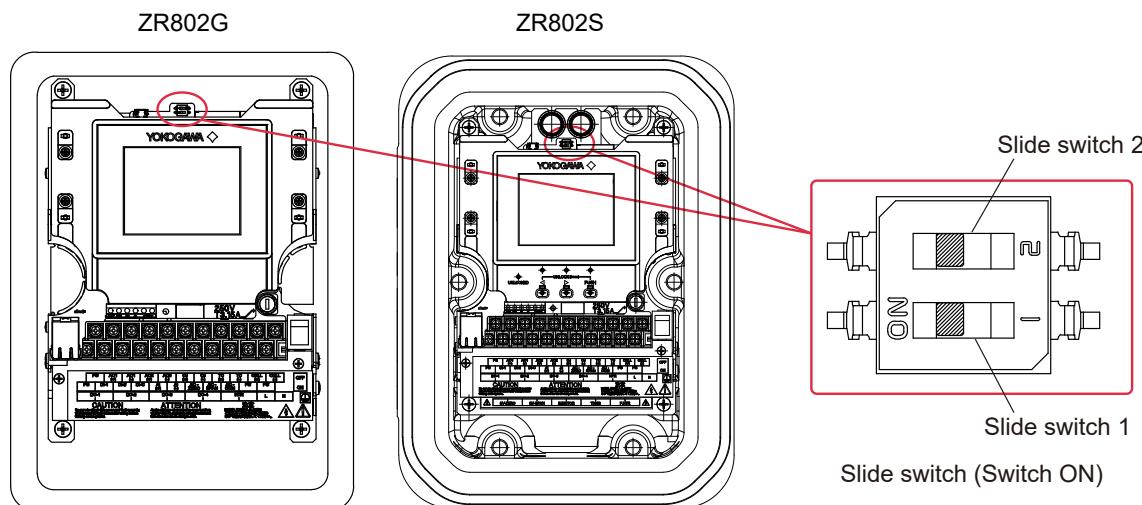
- **HART address (parameter: Poll addr)**

For Multi-drop connection: multiple number of field devices connect on a single HART cable, assign different address from 1 to 63 to each device on the single HART cable so that none of them have same address as others. When only one device is connected on HART, keep the default "0."

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 Section 8.7.7 in IM 11M12G01-02EN or Section 8.7.6 in IM 11M13G01-02EN User's manual.



Front view with the front panel opened

Figure 2 ZR802G/ZR802S Write Protection

CAUTION

Slide switch 1 is for the write protection. For Slide switch 2, see Section "1.2.5 Device Malfunction during the warmup. (Field Device Status)".

1.2.3 Device Variable Code

Use Device Variable Code for ZR802G/ZR802S to set device variables from SV to QV or to Read process values on Command 9.

Code	Name	Oxygen analyzer	Humidity analyzer	PV	SV	TV	QV
0	Oxygen	○	○	X	X	X	X
1	Humidity	N/A	○	X	X	X	X
2	Mixing ratio	N/A	○	X	X	X	X
3	Relative humidity	N/A	○	X	X	X	X
4	Dew point	N/A	○	-	X	X	X
5	Air ratio	○	N/A	-	X	X	X
6	Moisture	○	N/A	-	X	X	X
7	Cell temp	○	○	-	X	X	X
8	CJ temp	○	○	-	X	X	X
9	Gas temperature	N/A	○	-	X	X	X
10	Gas gage pressure	○	N/A	-	X	X	X
11	Cell mV	○	○	-	X	X	X
12	TC mV	○	○	-	X	X	X
13	CJ resistance	○	○	-	X	X	X
14	CJ mV	○	○	-	X	X	X
15	AI mA	○	○	-	X	X	X
16	Simple cell resistance	○	○	-	X	X	X

X: configurable

-: not configurable

N/A: Value is non-number (NaN)

ZR802G/ZR802S 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
MΩm	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	Reserved	-	N
		1	Reserved	-	N
		2	Reserved	-	N
		3	Reserved	-	N
		4	Converter user param. Failure	4	F
		5	MAC address failure	3	F
		6	Converter data failure	2	F
		7	Hardware failure	1	F
Device Specific Status 1	1	0	Reserved	-	N
		1	Reserved	-	N
		2	Reserved	-	N
		3	Sensor user param. failure	20	F
		4	Sensor EEPROM failure	19	F
		5	A/D converter failure	18	F
		6	Heater temperature failure	17	F
		7	Cell voltage failure	16	F
Device Specific Status 2	2	0	Humidity low low alarm	108	C
		1	Humidity low alarm	107	C
		2	Humidity high alarm	106	C
		3	Humidity high high alarm	105	C
		4	Oxygen low low alarm	104	C
		5	Oxygen low alarm	103	C
		6	Oxygen high alarm	102	C
		7	Oxygen high high alarm	101	C
Device Specific Status 3	3	0	R.H. low low alarm	116	C
		1	R.H. low alarm	115	C
		2	R.H. high alarm	114	C
		3	R.H. high high alarm	113	C
		4	Mixing low low alarm	112	C
		5	Mixing low alarm	111	C
		6	Mixing high alarm	110	C
		7	Mixing high high alarm	109	C
Device Specific Status 4	4	0	Reserved	-	N
		1	Reserved	-	N
		2	Reserved	-	N
		3	Reserved	-	N
		4	Calibration stability alarm	120	C
		5	AO2 saturation	119	S
		6	Reserved	-	N
		7	Simple cell resist. alarm	117	M
Device Specific Status 5	5	0	TC voltage low alarm	208	S
		1	TC voltage high alarm	207	S
		2	CJ temp. low alarm	206	S
		3	CJ temp. high alarm	205	S
		4	Span correction low alarm	204	C
		5	Span correction high alarm	203	C
		6	Zero correction low alarm	202	C
		7	Zero correction high alarm	201	C

*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)
Extended Device Status	6	0	Maintenance Required(NE107: M)	-	N
		1	Device Variable Alert	-	S
		2	Critical Power 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
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

*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)
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	Reserved	-	N
		1	Reserved	-	N
		2	Input pressure low alarm	214	C
		3	Input pressure high alarm	213	C
		4	Input temp. low alarm	212	C
		5	Input temp. high alarm	211	C
		6	AI current low alarm	210	S
		7	AI current high alarm	209	S
Device Specific Status 7	15	0	Reserved	-	N
		1	Reserved	-	N
		2	Reserved	-	N
		3	Reserved	-	N
		4	Reserved	-	N
		5	Reserved	-	N
		6	Reserved	-	N
		7	Battery low alarm	301	M
Device Specific Status 8	16	0	Calibration mode	-	N
		1	Blowback mode	-	N
		2	Maintenance mode	-	N
		3	Simple cell resist. mode	-	N
		4	AO2 fixed	-	N
		5	Reserved	-	N
		6	Reserved	-	N
		7	Reserved	-	N
Device Specific Status 9	17	0	Reserved	-	N
		1	Reserved	-	N
		2	Reserved	-	N
		3	Reserved	-	N
		4	Reserved	-	N
		5	Fast warmup alarm	319	M
		6	Purging	-	N
		7	Warmup mode	-	N
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

*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 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.

1.2.5 Device Malfunction during the warmup. (Field Device Status)

No measurement value is valid from the time when ZR802G/ZR802S starts up until the warm-up completes. During this period, HART protocol issues Device Malfunction of Field Device Status. Set Slide Switch 2 to ON ("Figure 2 ZR802G/ZR802S Write Protection") so that the Device Malfunction won't be issued.

If the instrument detects any Failure alarm, Device Malfunction is issued, no matter what status the Slide Switch is on.

1.3 Precaution

- **Setting on the ZR802G/ZR802S and a setup tool**

HART/MODBUS network/the panel operation, they cannot be established simultaneously to change the setting of ZR802G/ZR802S.

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

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

The large number of parameters are configured in ZR802G/ZR802S. 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 ZR802G/ZR802S is revised.

- **Auto cancellation of Output Loop Test**

During the Loop test of AO, DO, SV terminal output via HART, the test output is set by default to be automatically released. This prevents you from forgetting to release the test output. If no setting related to Loop test is changed for 10 minutes, the test is by default automatically released. If you want to extend the time limit beyond 10 minutes, change the parameter : Test auto release time.

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

Process variables root menu	<table border="1"><tr><td>View process variables</td><td><table border="1"><tr><td>Dynamic variables</td><td><table border="1"><tr><td>PV</td></tr><tr><td>PV % rnge</td></tr><tr><td>SV</td></tr><tr><td>TV</td></tr><tr><td>QV</td></tr><tr><td>PV is</td></tr><tr><td>SV is</td></tr><tr><td>TV is</td></tr><tr><td>QV is</td></tr><tr><td>Dynamic variables status</td></tr></table></td></tr><tr><td>PV quality</td></tr><tr><td>PV limit</td></tr><tr><td>SV quality</td></tr><tr><td>SV limit</td></tr><tr><td>TV quality</td></tr><tr><td>TV limit</td></tr><tr><td>QV quality</td></tr><tr><td>QV limit</td></tr></table></td></tr><tr><td></td><td><table border="1"><tr><td>Device variables</td><td><table border="1"><tr><td>Oxygen</td></tr><tr><td>Humidity</td></tr><tr><td>Mixing ratio</td></tr><tr><td>Relative humidity</td></tr><tr><td>Dew point</td></tr><tr><td>Air ratio</td></tr><tr><td>Moisture</td></tr><tr><td>Cell temp</td></tr><tr><td>CJ temp</td></tr><tr><td>Gas temperature</td></tr><tr><td>Gas gage pressure</td></tr><tr><td>Simple cell resistance</td></tr></table></td></tr></table></td></tr><tr><td></td><td><table border="1"><tr><td>IO&physical variables</td><td><table border="1"><tr><td>AO1</td></tr><tr><td>AO2</td></tr><tr><td>AI mA</td></tr><tr><td>Contact in/out status</td></tr><tr><td>Cell mV</td></tr></table></td></tr></table></td></tr></table>	View process variables	<table border="1"><tr><td>Dynamic variables</td><td><table border="1"><tr><td>PV</td></tr><tr><td>PV % rnge</td></tr><tr><td>SV</td></tr><tr><td>TV</td></tr><tr><td>QV</td></tr><tr><td>PV is</td></tr><tr><td>SV is</td></tr><tr><td>TV is</td></tr><tr><td>QV is</td></tr><tr><td>Dynamic variables status</td></tr></table></td></tr><tr><td>PV quality</td></tr><tr><td>PV limit</td></tr><tr><td>SV quality</td></tr><tr><td>SV limit</td></tr><tr><td>TV quality</td></tr><tr><td>TV limit</td></tr><tr><td>QV quality</td></tr><tr><td>QV limit</td></tr></table>	Dynamic variables	<table border="1"><tr><td>PV</td></tr><tr><td>PV % rnge</td></tr><tr><td>SV</td></tr><tr><td>TV</td></tr><tr><td>QV</td></tr><tr><td>PV is</td></tr><tr><td>SV is</td></tr><tr><td>TV is</td></tr><tr><td>QV is</td></tr><tr><td>Dynamic variables status</td></tr></table>	PV	PV % rnge	SV	TV	QV	PV is	SV is	TV is	QV is	Dynamic variables status	PV quality	PV limit	SV quality	SV limit	TV quality	TV limit	QV quality	QV limit		<table border="1"><tr><td>Device variables</td><td><table border="1"><tr><td>Oxygen</td></tr><tr><td>Humidity</td></tr><tr><td>Mixing ratio</td></tr><tr><td>Relative humidity</td></tr><tr><td>Dew point</td></tr><tr><td>Air ratio</td></tr><tr><td>Moisture</td></tr><tr><td>Cell temp</td></tr><tr><td>CJ temp</td></tr><tr><td>Gas temperature</td></tr><tr><td>Gas gage pressure</td></tr><tr><td>Simple cell resistance</td></tr></table></td></tr></table>	Device variables	<table border="1"><tr><td>Oxygen</td></tr><tr><td>Humidity</td></tr><tr><td>Mixing ratio</td></tr><tr><td>Relative humidity</td></tr><tr><td>Dew point</td></tr><tr><td>Air ratio</td></tr><tr><td>Moisture</td></tr><tr><td>Cell temp</td></tr><tr><td>CJ temp</td></tr><tr><td>Gas temperature</td></tr><tr><td>Gas gage pressure</td></tr><tr><td>Simple cell resistance</td></tr></table>	Oxygen	Humidity	Mixing ratio	Relative humidity	Dew point	Air ratio	Moisture	Cell temp	CJ temp	Gas temperature	Gas gage pressure	Simple cell resistance		<table border="1"><tr><td>IO&physical variables</td><td><table border="1"><tr><td>AO1</td></tr><tr><td>AO2</td></tr><tr><td>AI mA</td></tr><tr><td>Contact in/out status</td></tr><tr><td>Cell mV</td></tr></table></td></tr></table>	IO&physical variables	<table border="1"><tr><td>AO1</td></tr><tr><td>AO2</td></tr><tr><td>AI mA</td></tr><tr><td>Contact in/out status</td></tr><tr><td>Cell mV</td></tr></table>	AO1	AO2	AI mA	Contact in/out status	Cell mV
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AO1																																																
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Contact in/out status																																																
Cell mV																																																

		TC mV CJ resistance CJ mV Heater duty
	Max&Min&Average	Oxygen
		Max oxygen Max oxygen date Max oxygen time Min oxygen Min oxygen date Min oxygen time Ave oxygen
	Humidity	Max humidity Max humidity date Max humidity time Min humidity Min humidity date Min humidity time Ave humidity
	<COLUMNBREAK> Mixing ratio	Max mixing ratio Max mixing ratio date Max mixing ratio time Min mixing ratio Min mixing ratio date Min mixing ratio time Ave mixing ratio
	Relative humidity	Max R.H. Max R.H. date Max R.H. time Min R.H. Min R.H. date Min R.H. time Ave R.H.
Set process variables	AO1(PV) range	PV is Change PV(AO1) selection PV LRV PV URV AO1 time constant AO1 output mode
	AO2 range	AO2 is Change AO2 selection AO2 LRV AO2 URV AO2 time constant

	AO2 output mode
	SV is
	TV is
	QV is
Calibration	Zero gas conc. Span gas conc. Semi-auto calib. Abort calib. View calib. results
	Update calib. results
	Calib. constants
	Zero correction ratio Span correction ratio <COLUMNBREAK> Cell response time Cell resistance Cell robustness
	1st calib. log
	1st calib. date 1st calib. time <COLUMNBREAK> 1st zero corr. ratio 1st span corr. ratio 1st cell resistance
	2nd calib. log
	2nd calib. date 2nd calib. time <COLUMNBREAK> 2nd zero corr. ratio 2nd span corr. ratio 2nd cell resistance
	3rd calib. log
	3rd calib. date 3rd calib. time <COLUMNBREAK> 3rd zero corr. ratio 3rd span corr. ratio 3rd cell resistance
Blowback	Start blowback Abort blowback

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 <COLUMNBREAK> 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 <ROWBREAK> Config changed count Clear config changed flag <COLUMNBREAK> Cell mV at latest fault TC mV at latest fault
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
	Extended Device Status
	Maintenance required Device variable alert Failure Out of Specification Function Check
	Standardized Status 0
	Simulation active Non-Volatile memory failure Environmental conditions out of range Electronic failure Device Configuration Locked
	Standardized Status 1
	Status Simulation Active Discrete Variable Simulation Active
	Device Specific Status 0

	Converter user param. failure MAC address read failure Internal com. failure Hardware failure
Device Specific Status 1	Sensor user param. failure Sensor EEPROM failure A/D converter failure Heater temperature failure Cell voltage failure
Device Specific Status 2	Humidity low low alarm Humidity low alarm Humidity high alarm Humidity high high alarm Oxygen low low alarm Oxygen low alarm Oxygen high alarm Oxygen high high alarm
<COLUMNBREAK>	
Device Specific Status 3	R.H. low low alarm R.H. low alarm R.H. high alarm R.H. high high alarm Mixing low low alarm Mixing low alarm Mixing high alarm Mixing high high alarm
Device Specific Status 4	Cal. stability alarm AO2 saturation Simple cell resist. alarm
Device Specific Status 5	TC voltage low alarm TC voltage high alarm CJ temp. low alarm CJ temp. high alarm Span correction low alarm Span correction high alarm Zero correction low alarm Zero correction high alarm
Device Specific Status 6	Input pressure low alarm Input pressure high alarm Input temp. low alarm Input temp. high alarm AI current low alarm AI current high alarm
Device Specific Status 7	Battery low alarm
Device Specific Status 8	Calibration mode Blowback mode

	Maintenance mode Simple cell resist. mode AO2 fixed
Device Specific Status 9	Fast warmup alarm Warmup mode Purging
<ROWBREAK>	
Reset condensed status map	
Loop&status test	Test/simulation all clear Test auto release time AO test validity AO1 test output AO2 test output DO test validity DO test output Cal. DO test validity Cal. DO test output Contact in/out status Status simulation
Simple cell robustness	Simple cell robustness Simple cell resistance Start s-cell resist measure Abort s-cell resist hold
Device reset	

2.1.3 maintenance_root_menu

Maintenance root menu
Calibration
Simple cell robustness
Blowback
AO trim

2.1.4 device_root_menu

Device root menu
Basic setup
I/O condition
AO hold
AO limit/range change
AO trim
HART output
Contact output

- Tag
- Long tag
- Model setting
- Change model setting
- Detector
- Oxygen base
- Temperature unit
- Pressure unit
- Set process variables

- Warmup out. state
- Warmup preset val.
- Maint out. state
- Maint preset val.
- <COLUMNBREAK>
- Cal/BB/S-cell out. state
- Cal/BB/S-cell preset val.
- Fault out. state
- Fault preset val.

- AO lower limit
- AO upper limit
- <COLUMNBREAK>
- Range change O2 URV

- AO1 trim
- AO2 trim
- <COLUMNBREAK>
- Clear AO1 trim
- Clear AO2 trim

- Poll addr
- Loop current mode
- <COLUMNBREAK>
- Num req preams
- Num resp preams

- DO1 selection
- DO2 selection

	DO3 selection <COLUMNBREAK> DO1 state in operation DO2 state in operation DO3 state in operation
Contact input	DI1 selection DI2 selection <COLUMNBREAK> DI1 state in operation DI2 state in operation
Calib. condition	Zero gas conc. Span gas conc. Calib. mode Auto calib. procedure Calib. hold time [min] Calib. hold time [s] Calib. time [min] Calib. time [s] Auto calibration timing
	Calib. interval [d] Calib. interval [h] Calib. first start date Calib. first start time Calib. next date Calib. next time
Blowback condition	Blowback mode Blow hold time [min] Blow hold time [s] Blowback time [min] Blowback time [s] Auto blowback timing
	Blow interval [d] Blow interval [h] Blow first start date Blow first start time Blow next date Blow next time
Simple cell resist condition	S-cell resistance mode S-cell hold time [min] S-cell hold time [s] Auto s-cell resist timing
	S-cell interval [d] S-cell interval [h] S-cell first start date S-cell first start time S-cell next date S-cell next time
Alarm condition	

Alarm delay time	
Oxygen alarm	Oxygen HiHi alm conf. Oxygen HiHi alm SP Oxygen Hi alm conf. Oxygen Hi alm SP <COLUMNBREAK> Oxygen Lo alm conf. Oxygen Lo alm SP Oxygen LoLo alm conf. Oxygen LoLo alm SP <ROWBREAK> Oxygen Hysteresis
Humidity alarm	Humidity HiHi alm conf. Humidity HiHi alm SP Humidity Hi alm conf. Humidity Hi alm SP <COLUMNBREAK> Humidity Lo alm conf. Humidity Lo alm SP Humidity LoLo alm conf. Humidity LoLo alm SP <ROWBREAK> Humidity Hysteresis
Mixing ratio alarm	Mixing HiHi alm conf. Mixing HiHi alm SP Mixing Hi alm conf. Mixing Hi alm SP <COLUMNBREAK> Mixing Lo alm conf. Mixing Lo alm SP Mixing LoLo alm conf. Mixing LoLo alm SP <ROWBREAK> Mixing Hysteresis
Relative humidity alarm	R.H. HiHi alm conf. R.H. HiHi alm SP R.H. Hi alm conf. R.H. Hi alm SP <COLUMNBREAK> R.H. Lo alm conf. R.H. Lo alm SP R.H. LoLo alm conf. R.H. LoLo alm SP <ROWBREAK> R.H. Hysteresis
Simple cell resist alarm	S-cell resist alm conf. <COLUMNBREAK> S-cell resist alm SP

	Other alarms	Zero corr. Hi alm conf. Zero corr. Lo alm conf. Span corr. Hi alm conf. Span corr. Lo alm conf. <COLUMNBREAK> Cal. stability alm conf. Battery low alm conf. Fast warmup alm conf.
Other condition	Date & Time	Current date Current time <COLUMNBREAK> Set date & time
	Max & Min & Average	Average time <COLUMNBREAK> MaxMin time
	Fuel setting	Water vapor content Theoretical air volume <COLUMNBREAK> X value Abs. humidity out. air
	Input temp./pres. setting	Oxygen model setting Gage pres. type Gage pres. set val Gage pres. AI 4mA Gage pres. AI 20mA Gage pres. Hi alm conf. Gage pres. Hi alm SP Gage pres. Lo alm conf. Gage pres. Lo alm SP
	<COLUMNBREAK> Humidity model setting	Temp. type Temp. set val Temp. AI 4mA Temp. AI 20mA Temp. Hi alm conf. Temp. Hi alm SP Temp. Lo alm conf. Temp. Lo alm SP Exhaust gas abs. pres.

Display	Auto return time select Luminance select <COLUMNBREAK> Backlight auto off time select Adjust touch panel
Power supply	Power voltage Power frequency <COLUMNBREAK> Power voltage mode Power frequency mode
Misc	Meas. log storage cycle <COLUMNBREAK> Purging time
Device information	
HART identification	Tag Long tag Descriptor Message Date Final assembly num Distributor Model Dev id Write protect STX Count ACK Count
HART revisions	Fld dev rev Universal rev Software rev Hardware rev
Serial No.	
Main software rev	
IF software rev	

2.2 Offline

Upload variables	* Offline root menu has similar structure.
	Tag
	Long tag
	Model setting
	Detector
	Oxygen base
	Temperature unit
	Pressure unit
	PV is
	PV LRV
	PV URV
	AO1 time constant
	AO1 output mode
	AO2 is
	AO2 LRV
	AO2 URV
	AO2 time constant
	AO2 output mode
	SV is
	TV is
	QV is
	Warmup out. state
	Warmup preset val.
	Maint out. state
	Maint preset val.
	Cal/BB/S-cell out. state
	Cal/BB/S-cell preset val.
	Fault out. state
	Fault preset val.
	AO lower limit
	AO upper limit
	Range change O2 URV
	Poll addr
	Loop current mode
	Num resp preams
	DO1 selection
	DO2 selection
	DO3 selection
	DO1 state in operation
	DO2 state in operation
	DO3 state in operation
	DI1 selection
	DI2 selection
	DI1 state in operation
	DI2 state in operation
	Zero gas conc.
	Span gas conc.
	Calib. mode
	Auto calib. procedure
	Calib. hold time [min]
	Calib. hold time [s]
	Calib. time [min]
	Calib. time [s]
	Calib. interval [d]
	Calib. interval [h]
	Calib. first start date
	Calib. first start time
	Blowback mode
	Blow hold time [min]
	Blow hold time [s]

Blowback time [min]
Blowback time [s]
Blow interval [d]
Blow interval [h]
Blow first start date
Blow first start time
S-cell resistance mode
S-cell hold time [min]
S-cell hold time [s]
S-cell interval [d]
S-cell interval [h]
S-cell first start date
S-cell first start time
Alarm delay time
Oxygen HiHi alm conf.
Oxygen HiHi alm SP
Oxygen Hi alm conf.
Oxygen Hi alm SP
Oxygen Lo alm conf.
Oxygen Lo alm SP
Oxygen LoLo alm conf.
Oxygen LoLo alm SP
Oxygen Hysteresis
Humidity HiHi alm conf.
Humidity HiHi alm SP
Humidity Hi alm conf.
Humidity Hi alm SP
Humidity Lo alm conf.
Humidity Lo alm SP
Humidity LoLo alm conf.
Humidity LoLo alm SP
Humidity Hysteresis
Mixing HiHi alm conf.
Mixing HiHi alm SP
Mixing Hi alm conf.
Mixing Hi alm SP
Mixing Lo alm conf.
Mixing Lo alm SP
Mixing LoLo alm conf.
Mixing LoLo alm SP
Mixing Hysteresis
R.H. HiHi alm conf.
R.H. HiHi alm SP
R.H. Hi alm conf.
R.H. Hi alm SP
R.H. Lo alm conf.
R.H. Lo alm SP
R.H. LoLo alm conf.
R.H. LoLo alm SP
R.H. Hysteresis
S-cell resist alm conf.
S-cell resist alm SP
Zero corr. Hi alm conf.
Zero corr. Lo alm conf.
Span corr. Hi alm conf.
Span corr. Lo alm conf.
Cal. stability alm conf.
Battery low alm conf.
Fast warmup alm conf.
Average time
MaxMin time
Water vapor content
Theoretical air volume

X value
Abs. humidity out. air
Gage pres. type
Gage pres. set val
Gage pres. AI 4mA
Gage pres. AI 20mA
Gage pres. Hi alm conf.
Gage pres. Hi alm SP
Gage pres. Lo alm conf.
Gage pres. Lo alm SP
Temp. type
Temp. set val
Temp. AI 4mA
Temp. AI 20mA
Temp. Hi alm conf.
Temp. Hi alm SP
Temp. Lo alm conf.
Temp. Lo alm SP
Exhaust gas abs. pres.
Auto return time select
Luminance select
Backlight auto off time select
Power voltage mode
Power frequency mode
Meas. log storage cycle
Purging time
Descriptor
Message
Date
Final asmby num

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