

General Specifications

Model AV550G
Zirconia Oxygen Analyzer
Averaging Converter



GS 11M12D01-01E

Overview

Zirconia oxygen analyzers are used in combustion facilities to measure the flue gas oxygen concentration. Boiler operators use the oxygen measurement to optimize fuel usage, minimize atmospheric emissions and reduce energy consumption.

A multiple point oxygen measurement system is required for situations when gas stratification in the flue duct affects combustion control. The AV550G Averaging Converter can accept inputs from up to eight zirconia oxygen detectors. It sends output signals for the individual as well as averages of multiple oxygen concentrations. A robust multipoint converter reduces installation and maintenance costs.

A large 5.7-inch color LCD shows various measurement, setup, calibration, and trend screens. Its intuitive touch screen, is easy to read and makes set up and maintenance simple. Other standard features include new self-diagnostics and a hot swap function that allows a desired probe to be disconnected/reconnected for inspection or maintenance just by turning off the power of the relevant channel.

The AV550G Averaging Converter is ideal for combustion control in large utility boilers or various industrial furnaces.

Features

- Full color touch screen.
- Special trend graph functions with customer graph configuration.
- Multiple display modes shows average data, single detector or all detector gas concentrations.
- Handles input of up to 8 oxygen detectors.
- "Hot swap" of channel cards so the analyzer remains on line while maintenance is performed.
- Eight 4-20mA outputs for individual detectors.
- Three 4-20mA outputs for average oxygen concentration outputs.
- Failed, in calibration, or alarming, detectors are automatically excluded from average calculations.



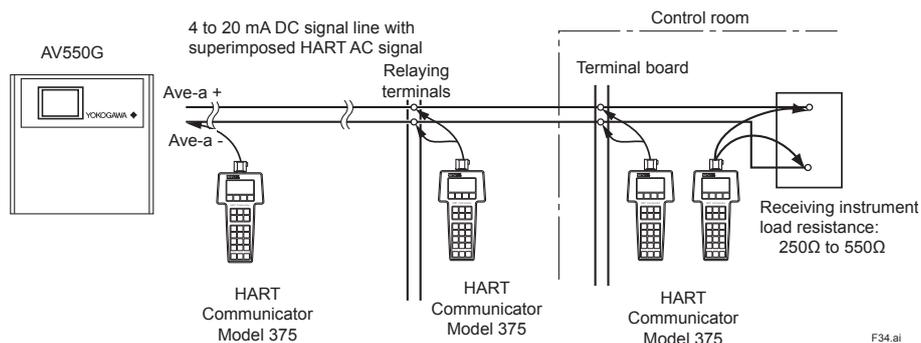
- Allows contact input, calibration activation, range change and detector performance validation.
- Remote maintenance using digital communications (HART or FOUNDATION Fieldbus) reduces maintenance costs. *1

*1: HART is a registered trademark of HART Communication Foundation.
FOUNDATION is a registered trademark of Fieldbus foundation.

Applications

Utility Boiler – With large boilers used in the utility industry, the oxygen concentration varies in different zones across the flue. In order to obtain the most reliable oxygen data, the most common method used is the arithmetical averaging of several measuring points using an external averaging unit. The model AV550G Averaging Converter not only averages the signals but fully controls all of the individual detectors thereby eliminating the need for costly, redundant hardware or DCS programming.

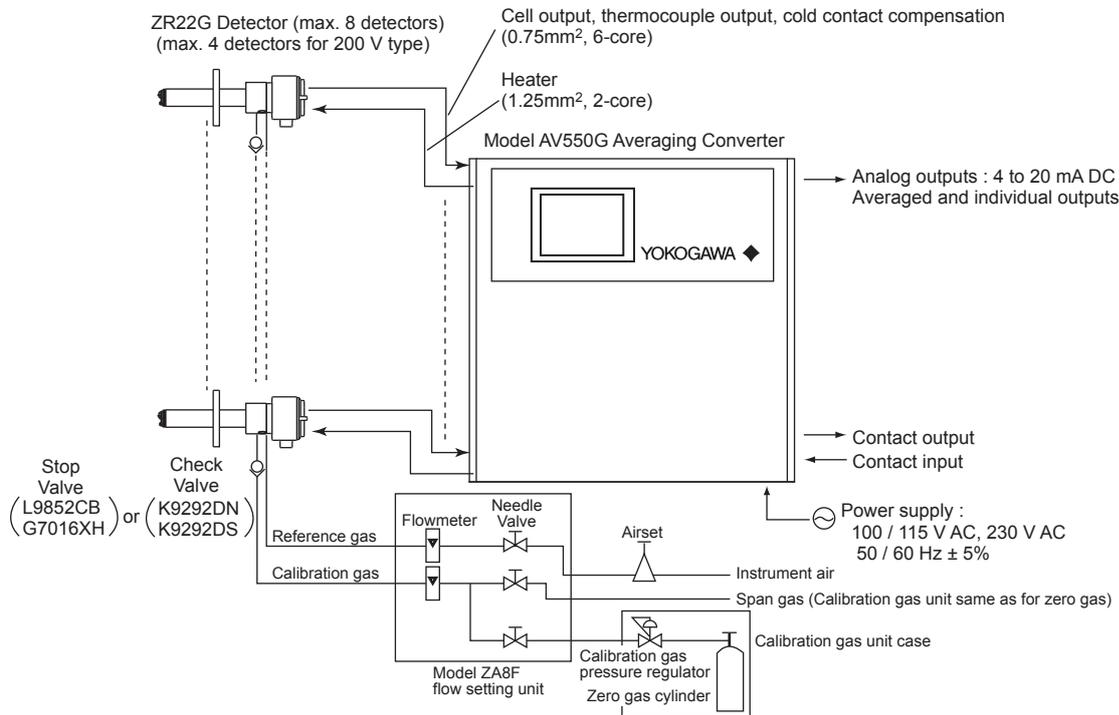
Process Heater – Process industries, such as refining, use large numbers of individual oxygen analyzers to maximize the combustion efficiency of process heaters. The model AV550G Averaging Converter receives and controls inputs from oxygen detectors mounted on the same or multiple flues and transmits either individual or averaged output signals.



Basic System Configuration

- Instrument air is used as the reference gas. (max. 8 detectors)

A standard gas cylinder can be used for the calibration gas for more accurate calibration.



F01.EF

■ STANDARD SPECIFICATIONS (Averaging Converter)

1. General Specifications

Compatibility of Detectors : ZR22G, ZO21D, ZO21DW

Number of Detectors : 1 to 8 (100 V type)

Expandable up to 8

Detectors : 1 to 4 (200 V type)

Expandable up to 4

(Note) Specify 4 Channel Base when 200 V type is selected.

Averaging interval: 0.2 seconds

Display: 5.7 inches color LCD display of size 320 by 240 dot with touch screen

Output Signal: 4 to 20 mA DC (maximum load resistance 550 Ω)

Average-value Output; 3 points

(Note) Number of averaging output is 2 when suffix code “-F” (FOUNDATION Fieldbus communication) is selected.

Independent Output; Output to each channel
Common isolation / Individual isolation selectable

Used exclusively for communication when suffix code “-F” (FOUNDATION Fieldbus communication) is selected.

Digital Communication (HART): 250 to 550 Ω, depending on number of field devices connected to the loop (multi-drop mode).

(Note) HART is a registered trademark of the HART Communication Foundation.

Contact Output: Contact capacity 30V DC 3A, 250V AC 3A (resistive load) Normally open / normally close selectable

Common Contact Output; 5 points, Four of the output points can be selected to either normally energized or normally deenergized status. Contact output 5 is normally energized.

Contact Output for Individual Channel Fail; Output to each channel

Normally energized.

Solenoid Valve Contact Output: Contact capacity 30V DC 1A, 250V AC 1A, voltage free contacts / 24 voltage (option) selectable
DC 24V power supply Maximum DC 30mA

Contact Input: 2 points, voltage free contacts

Ambient Temperature: -5 to +50°C

Storage Temperature: -20 to +70°C

Humidity Range: 10 to 85%RH (non-condensing)

Installation Altitude: 2000 m or less

Category based on IEC 1010: II (Note)

Pollution degree based on IEC 1010:2 (Note)

Note: Installation category, called over-voltage category, specifies impulse withstand voltage. Category II is for electrical equipment.

Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 is the normal indoor environment.

Power Supply Voltage: Ratings; 100 / 115 V AC, 230 V AC

Acceptable range; 85 to 126.5 V AC, 199.5 to 253 V AC

Power Supply Frequency: Rating; 50/60 Hz

Acceptable range; 50 Hz ±5%, 60 Hz ±5%

Power Consumption:

Max. 40 W + (120 W) (Number of detectors)
for steady operation (100 V type)

Max. 40 W + (220 W) (Number of detectors)
for warm-up (100 V type)

Max. 40 W + (140 W) (Number of detectors)
for steady operation (200 V type)

Max. 40 W + (220 W) (Number of detectors)
for warm-up (200 V type)

Safety and EMC Compliance**Safety Standards:**

EN61010-1

CAN/CSA-C22.2 No.61010.1

UL Std. No. 61010-1

EMC Standards:

EN 61326-1 Class A Table 2 (for use
in industrial locations)

EN 61326-2-3

EN 61000-3-2

EN 61000-3-3

CE, C-tick

Korea Electromagnetic Conformity Standard

Maximum Distance between Detector and Converter:

Conductor two-way resistance must be
10Ω or less (when a 1.25mm² cable or
equivalent is used, 300 m or less)

Construction: Indoor installation**Wiring Connection: Number of wire holes 30 pieces**

Wire hole size: Ø17 mm for grommet
Ø6 to Ø12 mm for cable gland
(option).

Installation: Wall mounting

Case: Aluminum alloy (100 V type), Steel plate
and Aluminum alloy (200 V type)

Paint Color: Silver Gray (Munsell 3.2PB7.4/1.2)

Finish: Polyurethane corrosion-resistance coating

Weight: Approx. 13 kg (100 V type), Approx. 25 kg
(200 V type)

Functions:**Display Functions:**

Value Display; Displays values of the measured
oxygen concentration, etc

Graph Display; Displays trends of measured
oxygen concentration

Data Display; Displays various useful data
for maintenance, such as cell
temperature, reference junction
temperature, maximum/ minimum
oxygen concentration, or the like.

Status Message; Indicates an alarm or error
occurrence with flashing of the
corresponding icon. Indicates status
such as warming up, calibrating, or the
like by icon.

Alarm, Error Display; Displays alarms such as
“Abnormal cell e.m.f.” when any such
status occurs.

Calibration functions:

Auto-Calibration; It calibrates automatically at
specified intervals.

Semi-auto Calibration; Input calibration direction
on the touch screen or contact, then it
calibrates automatically afterwards.

Manual Calibration; Calibration with opening/
closing the valve of calibration gas in
operation interactively with an LCD
touch screen.

Validation Function: Permits control room
activation of zero, span or midpoint gas
concentrations without running an actual
calibration.

Blowback Function:

Output through the contact in the
set period and time. Auto/semi-auto
selectable.

Maintenance Functions:

Can operate updated data settings in
daily operation and checking. Display
data settings, calibration data settings,
blowback data settings, current output
loop check, input/output contact check.

Setup Functions:

Initial settings suit for the plant
conditions when installing the
converter. Equipment settings, current
output data settings, alarm data
settings, contact data settings, other
settings.

Self-diagnosis: This function diagnoses conditions
of the converter or the detector and
indicates when any abnormal condition
occurs.

Password Functions:

Enter your password to operate the
analyzer excepting data display.
Individual passwords can be set for
maintenance and setup

Display and Setting Content:**Measuring Related Items:**

Oxygen concentration (vol% O₂)

Display Items:

Cell e.m.f (mV), thermocouple e.m.f
(mV), cold junction resistance (Ω) or
voltage(mV), cell temperature (°C),
cold junction temperature (°C), span
correction factor (%), zero correction
factor (%), cell response time(second),
cell condition(in four grades), cell
internal resistance (Ω), next calibration
estimate (year/month/day), heater
on-time rate (%), time (year/month/
day, hour/minute), software revision,
maximum/minimum/ average oxygen
concentration(vol%O₂), calibration
record (ten times), internal temperature
rise alarm record.

Calibration Setting Items: Span gas concentration
(vol%O₂), zero-gas concentration
(vol%O₂), calibration mode (auto,
semi-auto, manual), calibration type
and method (zero-span calibration,
zero calibration only, span calibration
only), stabilization time (minute/second),
calibration time (minute/second),
calibration period (day/hour), starting
time (year/month/day, hour/minute)

Equipment Related Items: Measuring gas selection;
wet/dry Detector selection; ZR22/ZO21

Output Related Items: Analog output/output mode
selection, output conditions when
warming- up / maintenance/ calibrating
(during blowback) / abnormal, 4 mA
/ 20 mA point oxygen concentration
(vol%O₂), time constant, preset values
when warming-up / maintenance /
calibrating during blowback abnormal,
output preset values on abnormal.

Alarm Related Items:
 Oxygen concentration high-alarm/
 high-high alarm limit values (vol% O₂), oxygen concentration low-alarm/
 low-low alarm limit values (vol% O₂), oxygen concentration alarm hysteresis
 (vol% O₂), oxygen concentration alarm detection, alarm delay (seconds)

Converter Output: mA analog output (4 to 20mA DC (maximum load resistance of 550Ω)).
 Average-value output; 3 points (average value a, average value b,
 average $c = \frac{a + b}{2}$)

Independent Output; Output to each channel
 Range; any setting between 0 to 5 through 0 to 100 vol% O₂ in 1 vol% O₂, or partial range is available (Maximum range value/minimum range value 1.3 or more)

For the log output, the minimum range value is fixed at 0.1 vol% O₂.
 4 to 20 mA DC linear or log can be selected.

Input/output isolation.
 Output damping: 0 to 255 seconds.
 Hold/non-hold selection, preset value setting possible with hold

Contact Output: Five points, contact capacity 30 V DC 3 A, 250 V AC 3 A (resistive load) Four of the output points can be selected to either normally energized or normally deenergized status.
 Delayed functions (0 to 255 seconds) and hysteresis function (0 to 9.9 vol%O₂) can be added to high/low alarms.
 The following functions are programmable for contact outputs.
 (1) Abnormal, (2) High-high alarm, (3) High alarm, (4) Low-low alarm, (5) Low-alarm, (6) Maintenance, (7) Calibration, (8) Range switching answer-back, (9) Warm-up, (10) Calibration-gas pressure decrease (answerback of contact input), (11) Blowback start, (12) Process alarm (answerback of contact input), (13) Calibration coefficient alarm, (14) Internal temperature rise alarm. Contact output 5 is set to normally operated, fixed error status.

Contact Output for Individual Channel Fail: Output to each channel Normally energized.
 Each channel cards provides a failure contact output.
 (1)Abnormal cell, (2)abnormal cell temperature(high/low), (3)abnormal channel card, (4)abnormal control card, (5)abnormal card communication

Contact Input: Two points, contact input The following functions are programmable for contact inputs:
 (1) Calibration-gas pressure decrease alarm, (2) Range switching, (3) External calibration start, (4) Process alarm (if this signal is received, the heater power turns off), (5) Validation start, (6) Blow-back start

Self-diagnosis: Abnormal cell, abnormal cell temperature (high/low), abnormal channel card, abnormal control card, abnormal card communication

Calibration: Method; zero/span calibration
 Calibration mode; automatic, semi-automatic and manual (All are operated interactively with an LCD touch screen). Either zero or span can be skipped.

Zero calibration-gas concentration setting range; 0.3 to 100 vol% O₂ (0.01 vol%O₂ in smallest units). Span calibration-gas concentration setting range: 4.5 to 100 vol% O₂ (0.01 vol% O₂ in smallest units). Use nitrogen-balanced mixed gas containing 0 to 10 % scale of oxygen, and 80 to 100 % scale of oxygen for standard zero gas and standard span-gas respectively.

Calibration period; date/time setting; maximum 255 days/23hours.

■ **FOUNDATION Fieldbus communication function**

The bi-directional digital communication as standard for FOUNDATION Fieldbus that is established by Fieldbus foundation.

Interface : FOUNDATION Fieldbus H1 (communication speed : 31.25 kb/s)

Physical layer type : 113 (standard-power signaling, bus powered, non I.S.)

Communication line condition: power supply---9 to 32 VDC, current supply---15 mA (Max)

Signal insulation : communication terminal to grand terminal, dielectric strength 500 Vrms (50/60 Hz, 1 min).

Device : Link master

Function block :

AI block : 3 blocks (1 block for each channels)
 Transfer the data of averaging oxygen concentration to other instruments.

DI block : 2 blocks
 Transfer the status of error and alarm to other instruments.

MAI block 1 block (8 channels)
 Transfer the data of individual oxygen concentration to other instruments.

MAO block 1 block (8 channels)
 Import the data of other instruments.

■ **STANDARD ACCESORRIES (Averaging Converter)**

Name	Part No	Quantity	Remarks
Fuse	A1112EF	2	2.5A
Hexagonal Allen Wrench	L9827AS	1	For lock screw

■ MODEL AND SUFFIX CODES

1. Detector

Refer to GS 11M12A01-01E for a detailed explanation of the detector specifications and available accessories.

2. Averaging Converter

Model	Suffix Code	Option code	Description
AV550G	-----	-----	Averaging Converter
Base (*1)	-A -B	----- -----	4 Channel Base 8 Channel Base
Number of Channel Cards (*2)	-A1 -A2 -A3 -A4 -A5 -A6 -A7 -A8 -B1 -B2 -B3 -B4 -B5 -B6 -B7 -B8	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----	1 Oxygen Channel Card, Common Isolation 2 Oxygen Channel Cards, Common Isolation 3 Oxygen Channel Cards, Common Isolation 4 Oxygen Channel Cards, Common Isolation 5 Oxygen Channel Cards, Common Isolation 6 Oxygen Channel Cards, Common Isolation 7 Oxygen Channel Cards, Common Isolation 8 Oxygen Channel Cards, Common Isolation 1 Oxygen Channel Card, Individual Isolation 2 Oxygen Channel Cards, Individual Isolation 3 Oxygen Channel Cards, Individual Isolation 4 Oxygen Channel Cards, Individual Isolation 5 Oxygen Channel Cards, Individual Isolation 6 Oxygen Channel Cards, Individual Isolation 7 Oxygen Channel Cards, Individual Isolation 8 Oxygen Channel Cards, Individual Isolation
Display	-J -E -F -G	----- ----- ----- -----	Japanese English French German
Power supply	-1 -2	----- -----	100 / 115 V AC 230 V AC (*3)
Communication	-E -F	----- -----	HART communication FOUNDATION Fieldbus communication (*4)
Options		/SCT /24 /G □□	Stainless steel tag plate 24 Voltage output for Solenoid valve Cable gland (Numbers in □□) (*5)

(*1) Select code "-B" (8 Channel Base) when future expansion exceeding 4 channels is expected. By so doing, the expansion can be made economically.

(*2) Common isolation is recommended, when the same instrument receives the analog outputs from each channel card. Individual isolation is recommended to prevent the trouble by mutual interference, when different instrument receives the analog outputs from each channel card.

(*3) When suffix code "-2" (230 V AC) is selected, select code "-A" (4 Channel Base).

(*4) When suffix code "-F" (FOUNDATION Fieldbus communication) is selected, used exclusively for communication

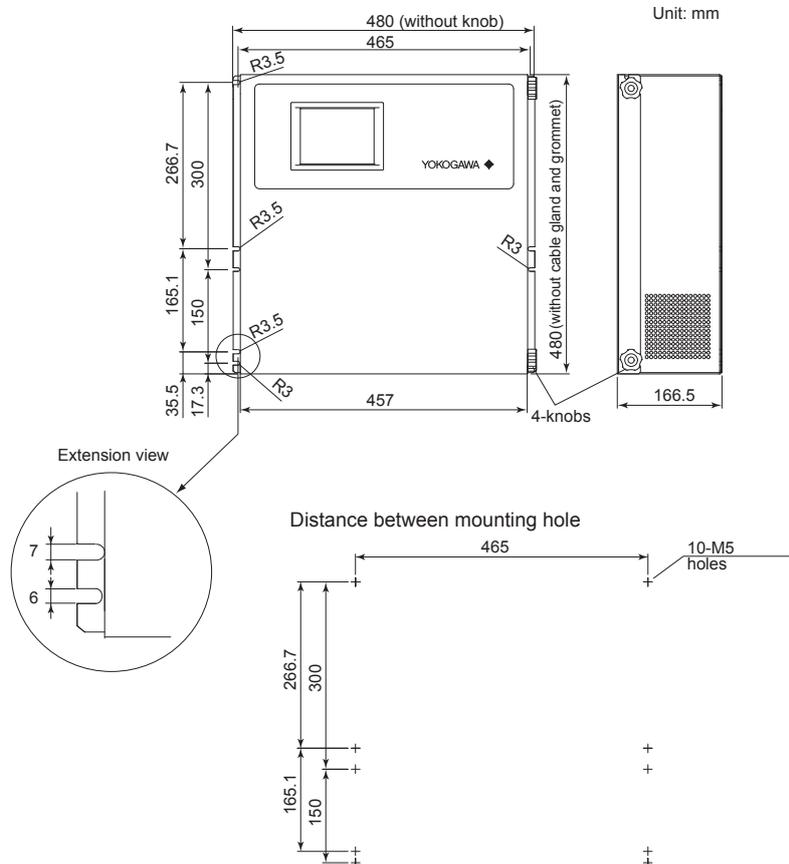
(*5) Input 01 to 30 in □□

3. Channel Card

Model	Suffix Code	Option code	Description
AV55CM	-----	-----	Channel Card
Number of Channel Cards (*1)	-A1	-----	1 Oxygen Channel Card, Common Isolation
	-A2	-----	2 Oxygen Channel Cards, Common Isolation
	-A3	-----	3 Oxygen Channel Cards, Common Isolation
	-A4	-----	4 Oxygen Channel Cards, Common Isolation
	-A5	-----	5 Oxygen Channel Cards, Common Isolation
	-A6	-----	6 Oxygen Channel Cards, Common Isolation
	-A7	-----	7 Oxygen Channel Cards, Common Isolation
	-A8	-----	8 Oxygen Channel Cards, Common Isolation
	-B1	-----	1 Oxygen Channel Card, Individual Isolation
	-B2	-----	2 Oxygen Channel Cards, Individual Isolation
	-B3	-----	3 Oxygen Channel Cards, Individual Isolation
	-B4	-----	4 Oxygen Channel Cards, Individual Isolation
	-B5	-----	5 Oxygen Channel Cards, Individual Isolation
	-B6	-----	6 Oxygen Channel Cards, Individual Isolation
	-B7	-----	7 Oxygen Channel Cards, Individual Isolation
	-B8	-----	8 Oxygen Channel Cards, Individual Isolation
—	-A	-----	Always -A
Options		/K1	Expansion power supply unit for dry contact output of solenoid valve output. (*2)
		/K2	Expansion power supply unit for 24 voltage output of solenoid valve output. (*3)

- (*1) -A □ are common Isolation types -B □ are Individual Isolation types
Up to 4 channel cards can be added in the 230 VAC version.
- (*2) Expansion power supply unit is required, when using the 4 channel base and extending the channel cards to five or more.
The expansion power supply unit cannot be added in the 230 VAC version.
- (*3) Expansion power supply unit is required, when using the 4 channel base and extending the channel cards to five more. Available only in U.S.

■ EXTERNAL DIMENSIONS



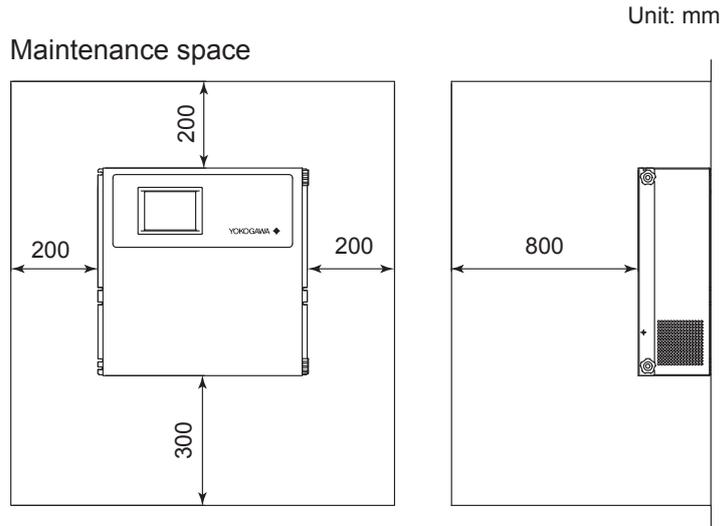
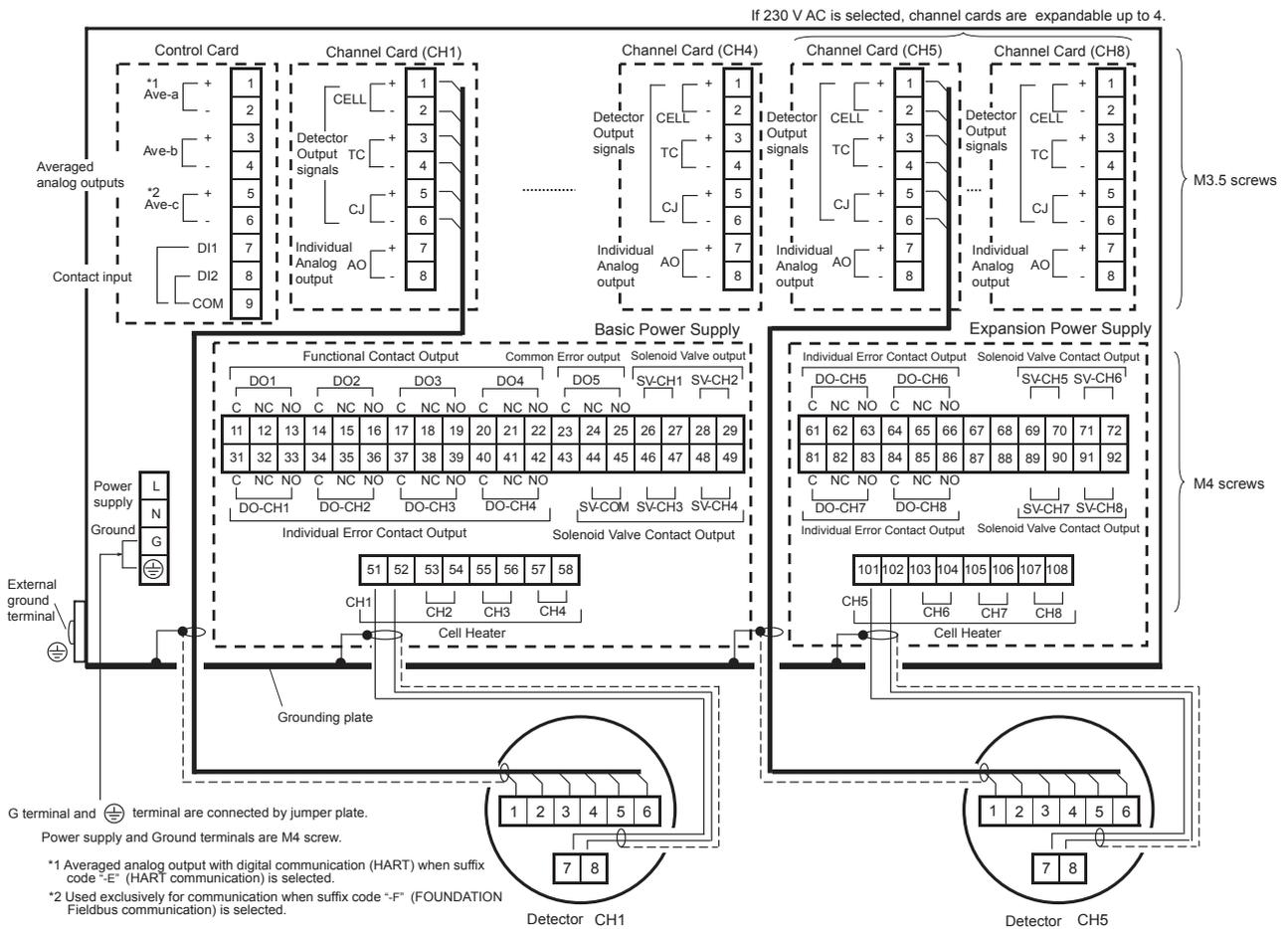


Fig.1 AV550G Averaging Converter

■ WIRING



Inquiry Sheet for Model AV550G Averaging Converter

Please place checkmarks in the appropriate boxes and fill in the necessary information in the blanks.

1. General information

Customer _____
Destination of delivery _____
Plant name _____
Measurement points _____

Object : indication record control alarm
Fuel : gas oil coal _____
Power requirements _____V AC _____Hz

2. Process conditions

2.1 Measurement gas components _____
2.2 Oxygen concentration Nor. _____ Min. _____ Max. _____ vol% O₂ _____
2.3 Temperature Nor. _____ Min. _____ Max. _____ °C _____
2.4 Pressure Nor. _____ Min. _____ Max. _____ kPa _____
2.5 Gas flow Nor. _____ Min. _____ Max. _____ m/sec _____
2.6 Dust type, Size Nor. _____ Min. _____ μm quantity _____ g/Nm³ _____
2.7 Corrosive gas No gas Gas _____ quantity _____ ppm _____
_____ quantity _____ ppm _____
2.8 Combustible gas No gas Gas _____ quantity _____ ppm _____
_____ quantity _____ ppm _____
2.9 Others _____

3. Installation site conditions

3.1 Ambient temperature 1. Around Detector temp. from _____ to _____ °C,
2. Around Converter temp. from _____ to _____ °C
3.2 Vibration No vibration Vibration _____
3.3 1 Probe installation location Furnace Stack Others _____
2 Probe position Horizontal Vertical Others _____
Indoor Outdoor Covered
3 Probe insertion length (m) (Note)
0.4, 0.7, 1.0, 1.5, 2.0, 2.5, 3.0, 3.6, 4.2, 4.8, 5.4
4 Flange DIN ANSI _____ Others _____
3.4 Instrument air supply Cannot be used. Can be used. _____ kPa
3.5 Averaging converter location Indoor Outdoor Covered (under roof)
3.6 Cable length between detector and converter _____ meters
3.7 Calibration method Manual Automatic
(Note) 3.6 m or more is available in the U.S.

4. Quotation data

Averaging Converter Probe protector
Detector Air set
Check valve Flow setting unit
Rc 1/4 connection ZA8F
1/4 NPT connection
Stop valve Others
Rc 1/4 connection
1/4 NPT connection