6.4.2 Checking the error information

Display message	State	Remarks
Er1	Fault of heater temperature	Appears when control temperature of the heater exceeds the set range. The heater control is stopped.
Er2	Disconnection detection	Appears when a open circuit is detected at the sensor, or thermocouple cable for temperature control. The heater control is stopped.
Er3	Sensor error	Appears when the A/D value is saturated.
Er4	Span calibration error	Appears when the span calibration is abnormal. (The calibration gas is unstable. / The calibration factor setting is inappropriate or outside of a +- 20% limit.)
Er5	Zero calibration error	Appears when the zero calibration is abnormal. (The calibration gas is unstable. / The calibration factor setting is inappropriate or outside of a +- 20% limit.)

Note:

If Er3 is displayed on start-up then check the sensor wiring polarity at the ZFK and ZKM terminals.

Er4&5; if a change of more than +- 20% is made due to operator error and the alarm is triggered, calibration is then limited to small steps. To restore full adjustment, enter the Calibration menu and press Error Clear.

6.4.3 Checking the alarm information

Display message	State	Remarks
ALM	Oxygen concentration error	Appears when the oxygen concentration exceeds any of specified HH / High / Lower / LL limit values. (Refer to “10.5.4” to “10.5.8”)
H	High limit error	Appears together with ALM.
L	Lower limit error	Appears together with ALM.
HH	HH limit error	Appears together with ALM.
LL	LL limit error	Appears together with ALM.

You can select one of the following seven alarms to output to the alarm contact (Contact No. 21 and 22 of the terminal block) when an oxygen concentration error occurs.

(1) [Not used] : No alarm is output to the contact output.
(2) [High limit alarm] : Alarm contact is output when an high limit alarm occurs.
(3) [Lower limit alarm] : Alarm contact is output when a lower limit alarm occurs.
(4) [HH limit alarm] : Alarm contact is output when an HH limit alarm occurs.
(5) [LL limit alarm] : Alarm contact is output when a LL limit alarm occurs.
(6) [High/lower limit alarm] : Alarm contact is output when an high or lower limit alarm occurs.
(7) [HH / LL limit alarm] : Alarm contact is output when an HH or LL limit alarm occurs.

6.5 Oxygen detector standard output voltage

O_2 concentration (%)	Output value (mV)	O_2 concentration (%)	Output value (mV)	O_2 concentration (%)	Output value (mV)
0.01	176.38	5.0	32.73	25.0	-4.475
0.1	123.15	10.0	16.71	30.0	-8.689
0.5	85.95	15.0	7.333	40.0	-15.34
1.0	69.93	20.0	0.683	50.0	-20.50
1.5	60.56	20.6	0	–	–
2.0	53.91	21.0	-0.445	–	–

9.5 Troubleshooting

Phenomena	Probable causes	Checking methods (normal value)	Remedy
No display	Converter fuse blown out Replaceable LCD damaged	Check the fuse and supply voltage specification.	Replace fuse or LCD Check supply voltage
Indication does not change or slow response	Filter and/or probe tube clogged	Visual check of filter and probe tube for contamination or clogging. Check for tightness and gas leaks at tubing connections and or detector 'O' ring.	Clean or replace filter Tighten all tubing connections
	Sensor deterioration	Switch between zero and span gas and check if 5 minutes or longer is needed for 90% response.	Replace sensor
	Decrease in flow velocity of exhaust gas	Check response to process gas after shutting down calibration gas flow. Move the direction (mounting position) of "arrow" of the probe slightly.	Increase process gas flow into the probe ensure tip is in flow.
Temperature alarm continues for more than 10 min. after power switched ON	Break in wiring Wiring error Power voltage is too low.	Check connecting cable for damage Wiring check Check of supply voltage specification	Replacement Correct wiring Check power supply
	Break of thermocouple	Break check (Continuity check ~ 2Ω)	Replace sensor
	Blown heater fuse	Check of power fuse	Replace fuse
	Break in detector heater	Check heater resistance 50 to 55Ω for 115V, 200 to 250Ω for 220V (Excluding wiring resistance)	Replace sensor
Automatic calibration is not possible	Difference between calibration gas concentration and its setting	Check the set value for calibration gas concentration.	Set proper value (Refer to "10.2.7")
	Wrong parameter setting	Check automatic calibration intervals.	□ Set parameters
	The calibration is prohibited by the contact input on the external terminal block.	Check if the calibration is not prohibited by any 'external' contact input on the terminal block.	• Set proper parameters • Correct wiring
	The heater is set to off by the contact input on the external terminal block.	Check if the heater is set to off by the contact input on the 'external' contact input on the terminal block.	• Set proper parameters • Correct wiring
Zero and/or span alarm	Difference between calibration gas concentration and its setting of >20% or misconnection between zero and span gas	Check the set value for calibration gas concentration. Cal error is in Cal menu	□ Set proper value □ Clear Cal error
		Check piping.	□ Correct piping
Indication too high or too low	Loose flange and/or its gasket or damaged detector O-ring (P36)	Check for gas leaks in ZFK detector and mounting part of probe flange or blow down port, solenoid and piping.	• Tighten mounting screws • Replace sensor
		Check for leaks from the outside.	□ Seal any leaks
	Detector is faulty.	Check for gas leaks at calibration gas inlet. Check sensor voltage (mV) for higher or lower than chart when flowing zero gas. (See "6.5 Oxygen detector standard output voltage")	• Tighten connectors • Leak Check ZFK8 • Replace sensor
	Abnormal detector temperature	Refer to check items for detector temperature alarm described above.	□ Replace sensor
	Indication difference between dry and wet basis measurement	Oxygen concentration is always higher on a dry basis (portable O2 units).	□ Normal
Unstable heater temp. readings	The power supply voltage is too high or too low.	Check that the supplied voltage is as specified.	□ Auto-tuning

Phenomena	Probable causes	Checking methods (normal value)	Remedy
Disconnection detection error Combustibles are present in the flue gas!	Break in thermocouple wire Break in sensor wire Wiring error High (>260 mV) reading also is a trigger for the above condition Heater power will be removed.	Cable, check for damage Wiring, check for continuity Incorrect connecting cable Check mV reading, 120mV is 0.1%O2 & 200mv= 0.01% O2 Run calibration gas as a proof	• Replace the defective parts. • Correct wiring • Turn on/off the power supply to reset system
Range cannot be switched.	"Range setting" is set in the contact input setting.	Check if "Range setting" is set in the contact input (Parameter menu).	Cancel "Range setting" > menu

Curated Data:

 If combustible gas (CO, H2 etc.) exists in the measured gas, an error will occur due to localized burning on the sensor leading to lower O2 (net) readings. The inclusion of corrosive (S) vapor, alkaline earth metals, P, Pb, V, Si etc.) will all shorten the life of the Pt sensor electrodes.

 When the measured gas temperature is high (300C or higher) the probe flange should be spaced back away from the stack or furnace wall to bring the detector flange surface temperature below the specified maximum value of 125C when powered). The probe tube flange can also be rotated in a direction so that the gas flow to the detector and flange is decreased.

 When excessive fly-ash is present in the gas, you should use a probe that includes blow back as these probes; ZTB, ZTB-ST or ZTA also feature sample gas filter cleaning whilst hot. The probes can also be angled down or mounted vertically if the 125C temperature limit is strictly observed as vertical mounting exposes the flanges to increased radiant heat from the uninsulated top surface of the boiler or furnace and an additional stand-off length or extra insulation will be required.

 For refuse incinerator applications, the automatic blow down duration should be reduced in the ZKM menu from the default of 30 seconds to 6 ~ 10 seconds as this reduce the cooling effect of the cold blow down air 'chilling' the flange below the 'acid dewpoint' leading to premature cold-end corrosion problems (most of the cleaning is achieved in the first few seconds of blow down).

Note: The design of the probe places the O2 sensor heater at the cold-end and this extra heat renders the probe much more resistant to cold-end corrosion than units that place the heater at the other end. For very corrosive applications it may be helpful to pre-heat the blow down air with a coil heated in a receiver tank or by the waste heat of the furnace! Manual cleaning when response slows is an option. When vertical installation is used, ensure that the vertical stand-off used is not overly long otherwise excessive flange cooling and cold end corrosion will take place. Insulation of the stand-off may be required to retain heat.

 Self-cleaning in the probes and on the ceramic filter surface only occurs when the fly ash is dry and friable rather than wet and paste like.

 If high levels of combustible gases are a possibility, then a flame arrestor is available and can be retrofitted to all probes except the high temperature ZTA probe which is not retrofittable but can be supplied as an option on a new ZTA unit. The flame arrestor always replaces the detector's ceramic filter which should be removed since the use of both units simultaneously will impair response time to process O2 changes.

 Successful probe cleaning requires a solenoid (CV=4) & 3/8"> ID tubing draining down to probe. It is important to avoid any 'U' bends in the piping that could collect condensed flue gas (water) between the probe connection and the solenoid valve as the water will crack the ceramic filter! Always keep the pressure > 40 psi and connection from the solenoid to the probe as short as possible.