Flue gas analyzer
HODAKATEST HT-1300Z
User manual

HT-1300Z
- typeS: O2,CO,℃
- typeA: O2,CO,NO,℃
- typeB: O2,CO,NO low,℃
- typeC: O2,COhigh,℃
- typeD: O2,CO,NO,NO2,℃
- typeE: O2,NO,NO2,SO2,℃

HODAKA
Saving energy

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ver.180801

1. Content

2. Introduction

2.1 The flue gas analyzer HT-1300Z

The flue gas analyzer HT-1300Z is used for the following purposes :

2.1.1 Function

- Flue gas measurement of O_2 , CO , NO , NO_2, SO_2
- Temperature measurement of flue gas
- Pressure measurement
- Deferential pressure measurement
- Calculation of efficiency, losses and so on.
- 4measurement items /8measurement items indication change(gas measurement)
- Data storage (100 data)
- Purge-pump for CO sensor protection(option)
- Auto-off function

2.1.2 Purposes

- Combustion control for oil and gas burners
- Maintenance for hot water boiler, steam boilers etc.
- Environmental analysis of incinerators
- Temperature control of industrial Furness.
- Flue gas control and maintenance of gas engine and cogeneration facilities
- Control and measurement for other facilities which related to oil and gas combustion

2.2 Important instructions regarding the user manual

The user manual is an important part of the scope of supply and assures not only the correct operation and use of the analyzer, but also the safety of the user and the environment.

Several marks are used in this manual. Below are the meaning of each marks.

DANGER	WARNING
High risk of decease or injure	Risk of decease or injure
NOTICE	
Risk of injure or possessions have damage.	Advice

2.3 Sensor

Sensor life is very much influenced by frequency in use , gas concentration, condensate. Generally, O2 sensor's life time is approx. 1to 2 years, CO/NO/NO2sensre is approx. 2 to 3 years. Even sensor is not used, it is exposed by ambient air, so sensor will naturally waste away.

3. SAFETY REGULATIONS

For safe and correct measurement, following safety instructions must be followed very carefully.

3.1 Safety instructions

DANGER

- The analyzer is only to be used with the delivered grip power.
- The analyzer is not be used in or under water
- After the measurement, vent the analyzer with ambient air and allow the probe to cool.
  A hot probe could burn individuals or cause fires in nearby flammable material.

WARNING

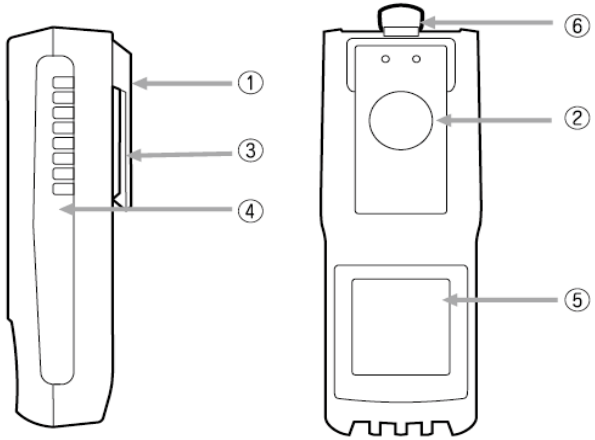
- The analyzer is NOT explosion protection. Please avoid to use at dangerous area.
- Exposed gas from the analyzer during measurement may including poison, therefore please be careful for ventilation.
- Moisture, being pumped out of the condensates trap can be slightly acidic.
  In case of skin contact IMMEDIATELY: clean affected parts of the body!
  Avoid getting liquid in eyes!
- The metal tube of the probe as well as any other metal parts/accessories are not to be used as electric conductors.
- The metal tube of the probe as well as any other metal/accessories are not to be used as electric conductors.

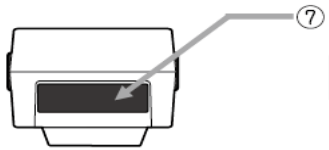
NOTICE

- The analyzer is not to be placed near or directly exposed to open fire or heat.
- Decomposition or remodeling must not be done.
- The indicated range of temperature of the probe is not to be exceeded, as the probe, temperature sensory mechanism and sensor could be destroyed.
- The analyzer must not be dropped
- The magnet is used at the rare housing. Therefore any precision machine should not be settled near the analyzer.
- After measurement, purge by fresh air, and dry condensate inside analyzer. Also incase filter is wet or dirty, please replace it.
- The analyzer must not be stored at high temperature and high moisture
- The exhalations of alcoholic combinations(f. ex. Attenuation, petrol, spirit, varnish・・・) may be damaged the sensor of the analyzer. Therefore it's forbidden to preserve or use these fluids near by the device.
- During zero setting, probe must be taken off from the chimney and be exposed fresh air.
- Zero setting with flue gas may causes sensor error.
- Please charge every 3 weeks. During long time storage, battery may discharge and sensor might be error or stored date might be loose.
- For correct measurement, please ask calibration to HODAKA CS center onece a year.
  (We recommend to do calibration every 6 months)

4. DEVICE ILLUSTRATIONS

4.1 Perspective View





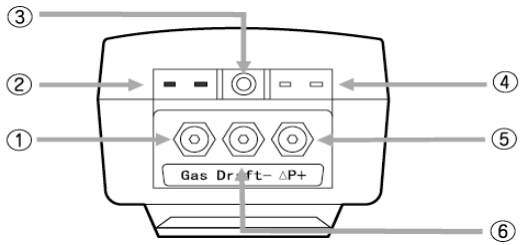
Exhausted gas through gas out let might include toxic gas. Do enough ventilation.

Do not see infrared ray.

①	Belt clip	④	Handle strip	⑦	IR interface
②	Magnet	⑤	Buttery cover		
③	Gas outlet	⑥	Strap ring		

During measurement the gas outlet below the belt clip must not be covered!
Closing gas out let might cause sensor error.

4.2 Connection port



①	Flue gas inlet port	④	Ambient air sensor connection port
②	Combustion air temperature sensor connection port	⑤	Pressure measurement port (Positive pressure measurement port for differential pressure measurement)
③	Battery charger connection port		
③	PC interface	⑥	Draft pressure measurement port (Negative pressure measurement port for differential pressure measurement)

4.3 Key board

⏻	Switch ON/OFF key	ESC	ESC / cancel key
F1	Function key F1	OK	OK key / confirmation
F2	Function key F2	◀	Selection key left
F3	Function key F3	▼	Selection key down
🖶	Printer key	▶	Selection key right
🗁	Submenu key	▲	Selection key up

5. Power supply

HT-1300Z can be operated by:

・Battery charger (AC100-240V 50/60Hz DC9V 550mA)

・Internal battery (Standard scope of supply / max. 8 hours continues operation (in case back right off))

> ⚠ **Danger** Use the HT-1300Z only with the HT power supply.

6. Storage

6.1 Operating and storage temperature

Operating : +0° C ～ +45° C

Storage : -20° C ～ +50° C

> ⚠ **Notice** Keep the device in dry aria.

6.2 Long term non-operating and storage

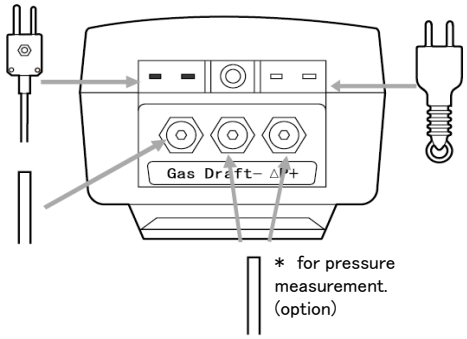
Even switch is off, small quantity of currency is used to keep sensors stable. Battery is also discharge by itself. So please charge every 3 weeks and check the remaining battery. Keep the device with low battery voltage might cause battery error or sensor error

> ⚠ **Notice** Do not storage the HT-1300Z with empty battery. In case you use HT-1300Z after long time storage, do complete discharge, then do full charge.

7. Measurement preparation

7.1 Probe connecting

Please connect to each connection port as pictures below.

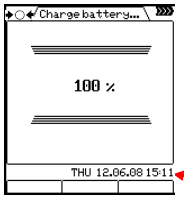


Option *Ambient air temp. is used to calculate efficiency and losses etc. In case this ambient air temp. sensor is not selected, main unit views the temperature value which is measured by flue gas temp. sensor of probe as the ambient air temp.

8. OPERATION

8.1 Operation – Basic

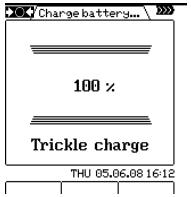
8.1.1 Charge



After the battery charger is connected, the indication changes to "Charge battery"
During the battery charger is connected, charge % is indicated.

It takes approx. 5 hours to charge from zero % to 100%

Date and time

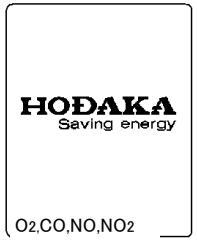


After battery is fully charged, it changed to trickle charge to avoid over charge.

we recommend that before charge the battery, use all battery voltage.

Remaining battery voltage

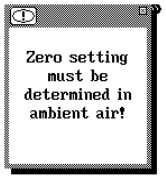
8.1.2 Switch on the unit



: Switch on the unit

The mounted sensors types are indicated on the bottom of window.
After approx. 5 sec., the unit automatically entries to the next window.

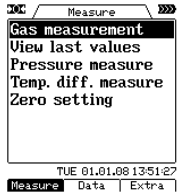
A message for zero setting will be indicated.



: Next window
No press OK key; after approx. 8 sec., the unit entries to next window automatically.

Notice During set to zero, the probe must not come into contact with the flue gas.

Approx. 30 sec. for zero setting



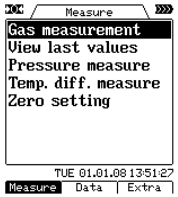
During calibration, the mark is indicated on left upper side of the window

: Calibration mark

Zero setting

Once zero setting is finished, calibration mark will be disappeared.

8.1.3 Star the measurement



No program change

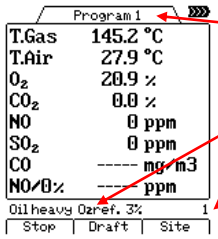
F1 : Measurement starts.
In case you use same Program No./Fuel/CO limit/O2 calculation value as previous time, is it possible to movie to measurement window by means of only press F1key.

Change the program

OK :「8.2.2 Measurement program selection」3
(in case the cursor is in the position of【Gas measurement】)

F2 :「8.3.1 Stored data menu」

F3 :「8.4.1 Setting menu」

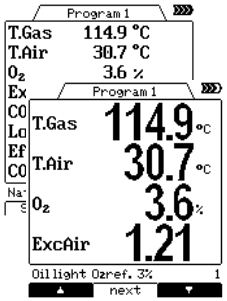


Selected measurement program

Fuel and O2 calculation value

Current page

Max.24 measurement items can be indicated
8 items/page total 3 pages
4 items/pages total 6 pages



:switch 4items indication/8 items indication

:page change

F1 :measurement start/stop

F2 :「8.2.5 **Draft measurement**」

F3 :「8.2.6 **Save data**」

ESC :Measurement menu

:「8.2.4 **Sub menu**」

:Print out

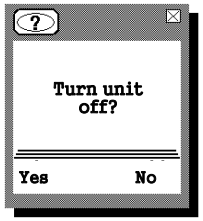
During measurement the gas outlet below the belt clip must not covered!
Closing gas out let might cause sensor error.

Measurement items

Indication	Items	Unit
O_2	Oxygen	%
CO_2	Carbon dioxide	%
CO	Carbon monoxide	ppm, mg/m^3, (mg/kWh, mg/MJ)*1
CO	Carbon monoxide	%
CO/0%	CO reference O2(O2=0%)	ppm
CO $refO_2$	CO reference O2(O2=?%)	ppm, mg/m^3, g/m^3
NO	Nitrogen monoxide	ppm, mg/m^3, (mg/kWh, mg/MJ)*1
NO/0%	NO reference O2(O2=0%)	ppm
NO $refO_2$	NO reference O2(O2=?%)	ppm, mg/m^3
NOx	Nitrogen oxide	ppm, mg/m^3, (mg/kWh, mg/MJ)*1
NOx/0%	NOx reference O2(O2=0%)	ppm
NOx $refO_2$	NOx reference O2(O2=?%)	ppm, mg/m^3
NO_2	Nitrogen dioxide	ppm
SO2	Sulfur dioxide	ppm, mg/m^3, (mg/kWh, mg/MJ)*1
SO2/0%	SOx reference O2(O2=0%)	ppm
SO_2 refO2	SOx reference O2(O2=?%)	ppm, mg/m^3
T.Gas	Combustion gas temperature	℃
T.Air	Ambient air temperature	℃
Losses	Losses	%
Effic.	Efficiency	%
ExAir	Excess air	%
Dew point	Dew point	℃

*1 ()Please do not use these units.

8.1.4 Switch off the unit



It is possible to switch off at all window.

F1 :Indicate left window

F3 :[Yes] for switch off
:[No] for NOT switch off

8.2 Operation – measurement menu

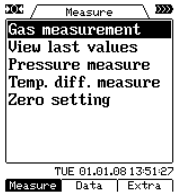
8.2.1 Measurement menu

F1:Measurement **F2:Stored data menu** **F3:Setting menu**

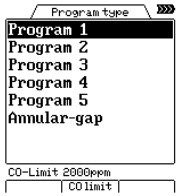
At the window, except the measurement window, if the instrument does not be used for more than 30 minutes, the instrument will be switched off automatically by "auto-off

8.2.2 Measurement program selection

8.2.2.1 Program selection



OK :Measurement program selection



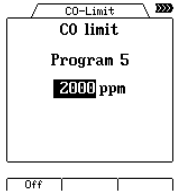
▲ ▼ :Move cursor up and down

F2 :「8.2.2.2 CO cut-off」

OK :Select one program among「program1」～「program5」、then enter to **「8.2.2.3 Fuel selection」**

It is possible to store the setting of「8.2.2.2 CO limit」「8.2.2.3 Fuel selection」「8.2.2.4 Fuel indication setting」「8.2.4.1 Sub menu item setting」

8.2.2.2 CO cut-off



◀ ▶ :change the CO threshold value
Can be set up every 100 ppm : 300ppm～3000ppm
Can be set up every 500 ppm : 3000ppm～10000ppm
If CO concentration exceeds threshold value, purge pump starts work and expose ambient air for protect sensor. (Incase the unit have purge pump)

If CO concentration exceeds threshold value, CO indication becomes「----」. (In case the unit does not have purge pump)

Purge:CO purge works
Limit over:CO value exceeds the thereshold value.
Range over :CO value eeceeds the measurement range.

In case the unit does not have CO sensor, CO purge pump is not also mounted.

F1 :CO measurement Off.

OK ESC :Back to **「8.2.2.1 Program selection」**

8.2.2.3 Fuel type selection

▲ ▼ :Move cursor up and down

OK :Select fuel type then entries measurement window

F2 :**「8.2.2.4 Fuel indication setting」**

In case select "Test gas",, calculated items, such as CO2, will not be calculated.

8.2.2.4 Fuel indication setting

Only fuels with check mark will be indicated on fuel selected window.

▲ ▼ :Move cursor up and down

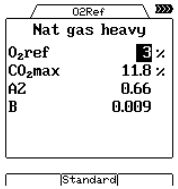
F1 :Activate / deactivate display of the selected measured value

F2 :**「8.2.2.5 O_2 reference value setting」**

OK ESC :**「8.2.2.3 Fuel type selection」**

Fuel type
13A→6C→LPG→kerosine→Light oil→Heavy A→Heavy C→Pellet

8.2.2.5 O_2 Reference value setting



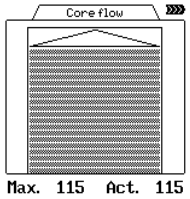
◀ ▶ : Change O_2 reference value

F2 : Turn back to initial value
Initial value : Test gas＝0%,other items =3%

OK ESC :「8.2.2.4 Fuel indication setting」

"CO2 max" of left window indicates CO2 max value of fuel.
Please ignore "A2" and "B".

8.2.3 Central current search



Max. 115 : The most highest temp.

Act. 106 : Current temp. which is measured by temperature sensor.

The central current search can be switched off on Device setting

Slowly insert probe to flue gas , then temperature sensor will catch the highest temperature.

Once the probe left the highest temperature, alarm sound becomes to short. Turn probe back to the former position and fix the probe by the cone.

OK : After fix the probe, enter to measurement window.

The central current search is the function that to find the most highest combustible gas temp. In case it is not necessary, it can be off on「8.4.1.1 Device setting 」

8.2.4 Sub menu

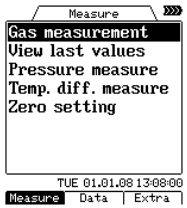
▲ ▼ : Move cursor up and down

OK :「8.2.2.2 CO Cut- off」
(In case cursor position is in [CO cut-off])

:「8.2.4.1 Sub menu item setting」
(in case cursor position is in [page selecting])

ESC : Move to measurement window

8.2.4.1 Sub menu item setting



▲ ▼ : Move cursor up and down

◀ ▶ : Change item

OK : Stop item selection, move to measurement window

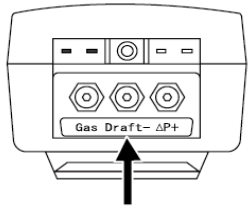
ESC :「8.2.1」 Draft sensor zero setting」

8.2.5 Draft measurement

F1 : Fix the draft measurement value

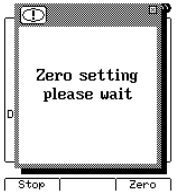
F3 :「8.2.5.1 Draft sensor zero setting」

ESC : Move to measurement window



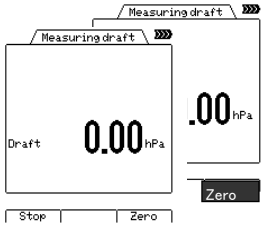
For draft measurement, please attach draft connector to "Draft –" port.

8.2.5.1 Draft sensor zero setting



OK : Next window

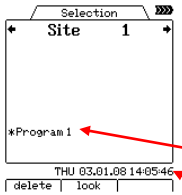
Notice Draft sensor zero setting must be in the ambient air.



During zero setting, the color of the letter[F3key(zero)] turns to black.

After finish zero setting, [F3key(zero)]turns back to normal.

8.2.6 Save data

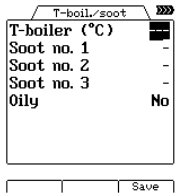


: scroll sites
Stored No. is shown as left window. You can write over it, but original data will be deleted.

F3 : Confirm the storage position.

Program No.

Date and time

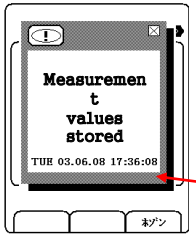


In case boiler temp.?/ smoke no. is[yes] on **「8.4.1.1 Device setting」**,left window is indicated.
Oily is indicated, in case smoke no. is Yes, .

: Change the value, yes/no

: Move cursor

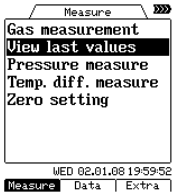
F3 : Save a data



Soot no. and Oily : Please fill out the sampling data which is taken by smoke tester.(Oily is the adherent unburned fuel on the filter paper of smoke tester.

Date and time

8.2.7 View last time data

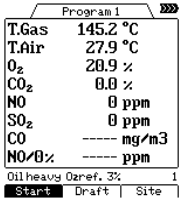


After the measurement is stopped by pressing [ESC key], it is possible to see last time value.

: Move cursor

OK : Select**「View last values」**,and confirm it.
Next window

Once turn off the unit, last time data will be cancelled.



: Page change

F1 : start measurement

F2 : **「8.2.5 Draft measurement」**

F3 : **「8.2.6 Save data」**

ESC : Move to the measurement window

: **「8.4.4 Sub menu」**

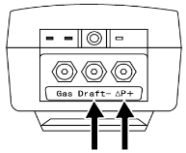
: Print out

8.2.8 Pressure measurement

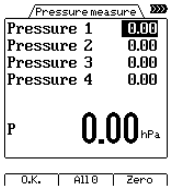
Max.4 points of pressure can be measured. Connect a hose to ΔP+ connection port. For differential pressure measurement, connect a second hose to Draft − connection port.
*For differential pressure measurement, optional probe is needed

: Move cursor

OK : Select **「Pressure measurement」**, confirm it.
Next window.



Positive pressure



: Move cursor

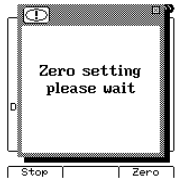
F1 : Confirm the value which is pointed by cursor.

F2 : Reset all pressure value 1to4 to 0.00hPa

F3 : Zero setting of pressure sensor.
Next window.

: Print out

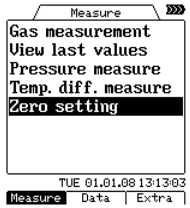
OK ESC : Stop pressure measurement, switch to measurement window.



OK : Stop the zero setting of pressure sensor.
Back to above window.

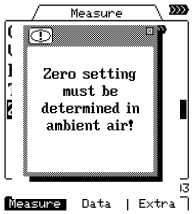
Notice Zero setting of pressure sensor must be determined in ambient air.

8.2.9 Zero setting



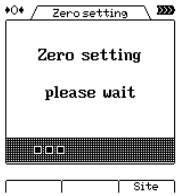
▲▼ : Move cursor

OK : Select 「**Zero setting**」, confirm it.
Next window.



OK : next window
In case you do not press Okay, after about 8 seconds, it automatically move to next window.

> **Notice** Zero setting must be determined in ambient air.



For zero setting, it takes about 30 seconds.

During zero setting, below mark is indicated.

calibration mark.

ESC : Switch it measurement menu window. During zero setting, you can set other parameters and see stored data.

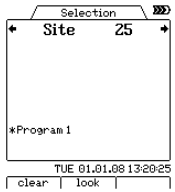
8.3 Operation – Stored data menu

8.3.1 Stored data menu

8.3.1.1 View stored No.

▲▼ : Move cursor

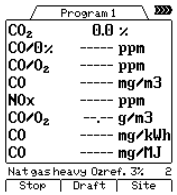
OK : Select 「**View stored sites**」, and confirm it.
Next window



◀▶ : Select stored sits.

F1 : Move to 「**8.3.2 Delete stored sites**」

F2 : Next window



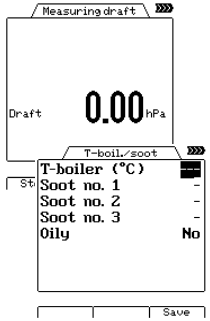
◀▶ : 4 lines/8 lines, indication change

▲▼ : Chang page

F1 F3

F2 : Next window

: Print out



F2 : Next window (boiler temperature / soot no.)

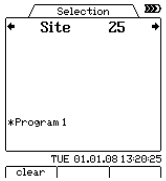
Left window is appeared only if you select "YES" at Boiler temp?/Smoke no.? of 「8.4.1.1 Unit setting」
"Oily" is appeared if you select "YES"at Smoke no.

F2 : Move to stored sites selection window

8.3.1.2 Delete stored sites

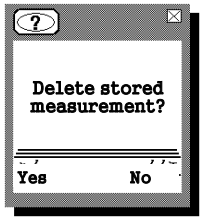
▲▼ : Move cursor

OK : Select 「**Delete sites**」, and confirm it.
Next window.



◀▶ : Select the sites to be deleted.

F1 : Next window



F1 : Delete the sites[Yes]

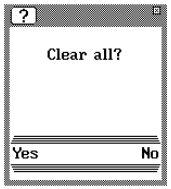
F3 : Not delete the sites[No]

After delete/not delete, move to previous window.

8.3.1.3 Delete all sites

▲▼ : Move cursor

OK : Select 「**Delete sites**」,confirm it
Next window



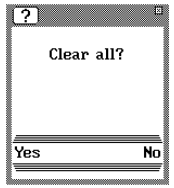
F1 : Delete the sites[Yes]

F3 : Not delete the sites[No]

After delete/not delete, move to previous window.

8.3.1.4 Import site data

Please do not use this function.



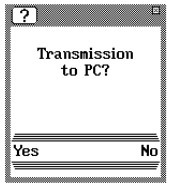
If 「**Import site data**」 is opened by mistake, left window will be shown. Press[F2key : No], and wait until the window is automatically switched to stored data menu.

8.3.1.5 Export stored data

▲▼ : Move cursor.

OK : Select 「**Export stored data**」, confirm it.
Next window

When you export stored data, please refer to the manual of Online View 2000 too.



F1 : Export [Yes]

F3 : Export [Yes]

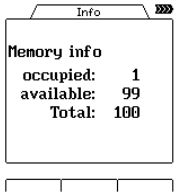
: Not export[No]

During data transmission, display becomes like left display.
After the data transmission, stored data menu.

8.3.1.6 Memory occupation

: Move cursor

: Select 「**Memory occupation**」, confirm it. Next window.



Current memory occupation is shown.

: Back to window above.

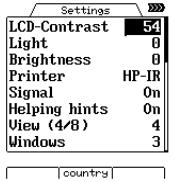
8.4.1 Operation – Setting menu

8.4.1 Setting menu

8.4.1.1 Unit setting

: Move cursor

: Select 「**Device settings**」, and confirm it. Next window

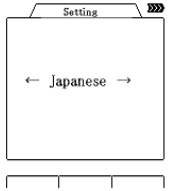


: Move cursor

: Change values

: Move to next window

: Back to above window



: Switch Japanese and English

: Back to above window

Setting items	Range	Description
LCD contrast	−14～7	Adjust LCD contrast
Back llight	0 ～ 30minuts	Set the lighting time of back light
Brightness	1～3	Set the brightness of back light
Printer	Unchangeable	–
Signal	On/Off	Key sound On/ Off
Window (4/8)	4 / 8	Set the measurement item quantity on display
Page	1 / 2 / 3	Set the measurement window pages
Boiler temp. ?	Yes/No	Set if it is indicated when store the data
Smoke no.?	Yes/No	Set if it is indicated when store the data
Measurement point	On/Off	Set if you set measuring point
COM	RS232/Blue.	When using the measurement software, select RS232 cable or Bluetooth.
NOx ratio	1.00～2.50	Set NO_2 ratio (When NO_2 sensor is not mounted)

8.4.1.2 Set time and date

: Move cursor

: Select 「**Set time and date**」, and confirm it. next window

: Cursor is indicated

: Back to above window

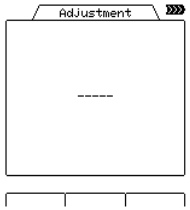
: change number

: Move cursor

: Back to above window

8.4.1.3 Service menu

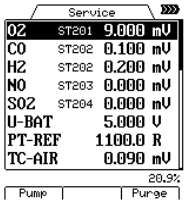
Please do not use this function.



If「Service」is opened by mistake, left window will be shown.
Press[ESC key] 5times.

8.4.1.4 Service

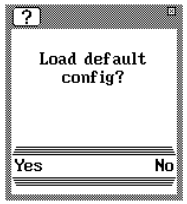
Please do not use this function.



If「Service」is opened by mistake, left window will be shown.
Press[ESC key] .

8.4.1.5 Default config.

Please do not use this function.



If「Service」is opened by mistake, left window will be shown.
Press[F3 key] .

8.5 Print out

For print out, optional infrared printer (HT-1610) is needed.

Warning Do not see infrared

A sample of gas measurement

```
**************************
 Measure      HT-1300Z
        SN 100012
**************************
 03.07.2018     08:38:54

 13A          15.8  12.2%
 Program1
 O2            20.9%
 CO2           0.03%
 NO             0.0ppm
 NO2            0.1ppm
                0.1ppm
 DewPnt.    ------°C
 Draft       0.00hPa

 T-boiler(°C)   84
 Soot no.1       0
 Soot no.2       0
 Soot no.3       1
 Oily           No
```

hour:minutes:seconds

O2ref.%

date,month,year

CO2 max. value

<Fuel>
13A
6C
LPG
Kerosene
Heavy oil A
Heavy oil C
Pellets

<Measurement items>
T.Gas (°C)
O_2 (%)
CO_2 (%)
CO (ppm)
CO (%)
NO (ppm)
NO_2 (ppm)
SO2(ppm)
NOx (ppm)
T.Air (°C)
Exc.Air
Losses (%)
Effic. (%)
CO/0% (ppm)
$COref O_2$ (ppm))
CO (mg/m^3)
NO/0% (ppm)
$NOref O_2$ (ppm)
NO (mg/m^3)
NOx/0% (ppm)
$NOxref O_2$ (ppm)
$NOx(NO_2)$ (mg/m^3)
SO2/0%(ppm)
SO2 refO2(ppm)
SO2(mg/m3)
Dew Point (°C)
Draft (hPa)

T-boiler (°C)
Soot no.1, 2, 3
Oily:(Yes), (No)

A sample of pressure

```
**************************
 Measure      HT-1300Z
        SN 100012
**************************
  03.07.2018    08:38:54

 Pressure Measurement
                      hPa
 Diff.Pressure 1    -0.13
 Diff.Pressure 2     0.65
 Diff.Pressure 3     1.78
 Diff.Pressure 4    -0.03

 P                24.38hPa
```

date,month,y

date,month,year

hour:minutes:seconds

9. Calculation basis

$$\text{Excess Air}(\lambda) = \frac{20.9(\%)}{20.9(\%) - O_2(\%)\ \text{in flue gas}}$$

$$CO_2\ (\%) = \frac{CO_2\text{Max} \times (20.9 - O_2(\%)\ \text{in flue gas}}{20.9(\%)}$$

$$\text{Losses} = \frac{(GO + (\lambda - 1) \times AO) \times 0.33 \times (\text{Combustable gas.}(℃) - (\text{Ambient temp. }℃)) \times 100}{\text{Calp (kcal/Nm}^3\text{ or kg)}}$$

$$\text{Efficiency} = 100 - \text{losses}$$

$$CO/O_2\ (\text{ppm}) = \frac{20.9(\%) - O_2\ \text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times CO(\text{ppm})$$

$$CO\ (\text{mg/m}^3) = CO(\text{ppm}) \times 1.249$$

$$CO/O_2\ (\text{mg/m}^3) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times CO(\text{mg/m}^3)$$

$$NO/O_2\ (\text{ppm}) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times NO(\text{ppm})$$

$$NO\ (\text{mg/m}^3) = NO(\text{ppm}) \times 1.339$$

$$NO/O_2\ (\text{mg/m}^3) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times NO(\text{mg/m}^3)$$

$$NOx\ (\text{ppm}) = NO(\text{ppm}) \times K(\text{manually adjustable}) \qquad NO_2 : \text{Non mounted}$$

$$NOx\ (\text{ppm}) = NO(\text{ppm}) + NO_2(\text{ppm}) \qquad NO_2 : \text{Mounted}$$

$$NOx/O_2\ (\text{ppm}) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times NOx(\text{ppm})$$

$$NOx\ (\text{mg/m}^3) = NOx(\text{ppm}) \times 2.053$$

$$NOx/O_2\ (\text{mg/m}^3) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times NOx(\text{mg/m}^3)$$

$$SO_2/O_2(\text{ppm}) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times SO_2x(\text{mg/m}^3)$$

$$SO_2(\text{mg/m}^3) = SO_2(\text{ppm}) \times 2.859$$

$$SO_2/O_2(\text{mg/m}^3) = \frac{20.9(\%) - O_2\text{reference}\%}{20.9(\%) - O_2(\%)\text{in flue gas}} \times SO_2\ (\text{ppm/m3})$$

$$\text{Dew Point} = \frac{4077.9}{16.7241 - \ln\left(1.1 + \frac{100}{1 + \frac{fw}{CO_2}}\right)} \times SO_2\ (\text{mg/m3})$$

Fuel data

	GO Nm^3	AO Nm^3	Calp kcal/Nm^3 or kcal/kg	CO_2Max	fw
Test gas	0.0	0.0	0	0.0	0
13A	12.04	10.95	9940	12.2	57
6C	4.89	4.08	4050	13.1	77
LPG	25.9	23.9	22350	13.8	77
kerosene	12.15	11.37	10570	15.1	111
Light oil	11.9	11.15	10280	15.4	111
Heavy A	11.37	10.68	10160	15.8	111
Heavy C	10.88	10.25	9750	16	111
Pellet	4.63	4.63	4200	20.3	0

GO：Theoretical flue gas volume, AO：Theoretical air volume, Calp：Lowe calorific value, CO2max：CO2 Max value of each fuel, fw：Humidity mark

*Fuel data might slightly differ depend on location, therefore calculated data also might have difference.

*In case measure sulfur-rich flue gas, actual dew point might differ from calculated dew point.

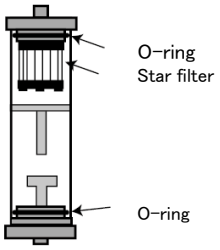
	HODAKA TEST® HT-1300Z		
Measure-ment	O_2	Measurement range	0～20.9vol%
		Accuracy	±0.2vol.%
		Resolution	0.1vol%
		Response	with in 20sec.
	CO(H2 Compensation)*1	Measurement range	0～2000ppm (max. over load 10000ppm)
		Accuracy	±10ppm or ±5% reading (0～2000ppm)*2
			±10% reading (2001～10000ppm)
		Resolution	1 ppm
		Response	Within 40sec.(0～2000ppm) Within 60sec.(2001～10000ppm)
	CO very high	Measurement range	0.00～4.00% (max. over load10.00%)
		Accuracy	±0.02% or ±5% reading (0.00～2.00%)*2
			±10% reading (2.01～10.00%)
		Resolution	0.01%
		Response	Within 60sec.(0.00～2.00%) Within 100sec.(2.01%～10.00%)
	NO	Measurement range	0～1000ppm (max. over load 3000ppm)
		Accuracy	±5ppm or ±5% reading (0～1000ppm)*2
			±10% reading (1001～3000ppm)
		Resolution	1 ppm
		Response	Within 40sec.(0～1000ppm) Within 60sec.(1001～3000ppm)
	NO low	Measurement range	0～300ppm
		Accuracy	±2ppm (0.0～39.9ppm)
			±5% reading (40.0～300ppm)
		Resolution	0.1 ppm(0.0～99.9ppm) 1ppm (100～300ppm)
		Response	Within 40sec.
	NO_2	Measurement range	0～200ppm (max.over load 500ppm)
		Accuracy	±10ppm (0～200ppm)
			±10% reading (201～500ppm)
		Resolution	1 ppm(0.1ppm)*3
		Response	Within 60sec.(0～200ppm) Within 100sec.(201～500ppm)
	SO_2	Measurement range	0～2000ppm (max. over load 4000ppm)
		Accuracy	±10ppm or ±5% reading (0～2000ppm)*2
			±10% reading (2001～4000ppm)
		Resolution	1 ppm
		Response	Within 60sec.(0～2000ppm) Within 100sec.(2001～4000ppm)
	Pressure	Measurement range	±100 hPa
		Accuracy	F.S.±2%
		Resolution	0.01 hPa
	Combustion air temp.	Measurement range	0～650℃ or 0～1100℃ (depend on probe)
		Accuracy	0～100℃: ±2℃
			100℃～: ±2% reading
		Resolution	0.1℃(0～999.9℃) 1℃(1000～1100℃)
	Ambient air temp.	Measurement range	0～100℃
		Accuracy	± 2℃
		Resolution	0.1℃
Calculated value *4	CO_2	0～CO_2Max (Calculation from O_2)	
	NOx	0～calculated value	
	O_2 reference value	0～calculated value (O_2 : Changeable by user)	
	Excess air	1.00～9.99	
	Losses	0～99.9%	
	Efficiency	0～100%	
	Dew point	0～100℃	
	mg/m^3		

Fuel	13A, 6C, LPG, Kerosene, Light oil, Heavy A, Heavy C, Pellet			
Sensor	O_2	galvanic		
	CO (CO very high)	electrochemical		
	NO (NO low)	electrochemical		
	NO_2	electrochemical		
	SO_2	electrochemical		
	Combustible gas temp.	K thermo couple		
	Ambient air temp.	K thermo couple		
Main unit	Temperature	Operating temp. : +0℃ ～ +45℃ Storage temp. : −20℃ ～ +50℃		
	Display	dot matrix 8items ⇔4items		
	Dimension	(W×H×D) 80 x 210 x 60 mm		
	Weight	Approx.680g		
	Power supply	External : Line power (AC100−240V 50/60Hz DC9V 550mA) Internal : NiMh batteries (max. 12hours continuous operation)		
Standard equipment	Built in	Pump, Interface for PC(RS232),CO purge pump*5 Data logger (100data)、interface for printer		
	Accessories	Adapter, Probe with sampling hose, Condensate trap, Pressure measurement hose, Soft case,Star filter		
	Description		**Art. No.**	**Specification**
	Sampling probe(with T-gas sensor)		HT−1001	L=300mm φ6mm ～650℃ hose 2700mm
	Sampling probe (with T-gas sensor)		HT−1012*6	L=300mm φ6mm ～650℃ hose 2700mm
Option	Probe handle		HT−7201SS	sampling hose 2700mm
			HT−7202SS*6	sampling hose 2700mm
	Probe tube (with combustible gas sensor)		HT−7230	L=300mm φ6mm ～650℃ hose 2700mm
			HT−7231	L=180mm φ5mm ～650℃ hose 2700mm
			HT−7235	L=500mm φ6mm ～650℃ hose 2700mm
			HT−7232	L=750mm φ6mm ～650℃ hose 2700mm
			HT−7233	L=750mm φ8mm ～1100℃ hose 2700mm
	CO purge pump		HT−2321	CO sensor protection
	Ambient temperature sensor		HT−2305	0～100℃
	Probes for temperature	K thermo-couple	HT−1251a	φ3×130L, 0～950℃, for air/liquids
			HT−1252a	φ1.5×130L, 0～950℃, for air/liquids
			HT−1253a	φ3×130L, 0～400℃,for air/liquids/food, centric top
			HT−1254a	130L, 0～400℃, for surface/rifts/air/liquid
			HT−1255a	φ4×130L, 0～650℃, for surface/air/liquid
			HT−1256a	0～450℃, magnetic probe for surface
			HT−1257a	0～180℃, Pliers probe for plates, tube
	Pressure sensor unit		HT−2303	Pressure, differential pressure, draft pressure
	Draft probe		HT−1050A	L=180mm, φ5mm, hose 3000mm
	Attach case		HT−2315	Dimension : 340mm×490mm×125mm Weight : 3kg
	Measurement software		HT−2074	Online View 2000 (Windows7/8.1/10)(with RS232 cable)
	Measurement software		HT−2084	Online View 2000 (Windows7/8.1/10)(with RS232 cable, USB cable)
	Blue tooth module*7		HT−1833	For measurement software
	Infrared printer		HT−1610	1 x printer roll paper, 4 x AAbattery
	Roll paper for infrared printer		HT−1636	5 Rolls

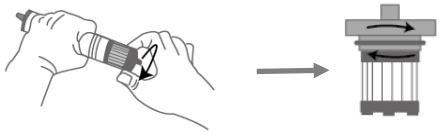
*1 For compensate measured value when measure gas incl. H2.
*2 Accuracy : Which is more higher value is applied as accuracy.
*3 In case NO low sensor is mounted, resolution is 0.1ppm at measurement range 0.0ppm to 99.9ppm
*4 Fuel data might slightly differ depend on location, therefore calculated data also might have difference.
*5 CO sensor non mounted model : CO purge pump is not mounted.
*6 For COhigh/NO2, SO2measurement.
*7 Measurement software (HT−2074) is needed.

Specification will be changed without notice.

11. Condensate trap



Exchange star filter

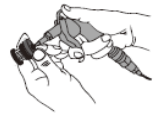


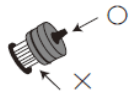
Turn the joint and take the star filter out.

Loose the star filter as arrows above.

Star filter is consumption parts. Once the color turns gray, exchange it.

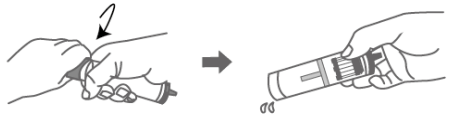
−emergency cleaning by using compressed air−





Cleaning of moisture

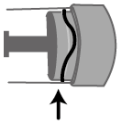
Take this cap off.



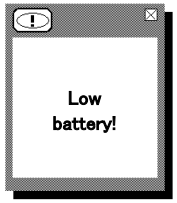
Turn the joint, and clear the moisture.

Be sure that the O−ring proerly put the slit of the joint.
Bad fitting may cause leakage.

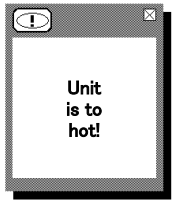
Bad sample:
O−ring is twisted.



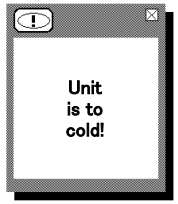
12. Message



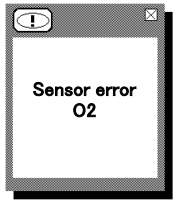
Condition Battery voltage is too low.
Reason 1 Battery charge is not enough.
Solution Charge the battery.
Reason 2 AC adapter contact is not good.
Solution Put AC adapter again.
Reason 3 AC adapter's broken wire
Solution Exchange AC adapter
Please ask to HODAKA CO.,LTD. for new wire.



Condition Inner temperature of the unit is too high.
Reason 1 Storage the unit in hot aria.
Solution Move the unit to cool aria.
Reason 2 Template sensor error.
Solution Please ask to HODAKA CO., LTD. for inspection.



Condition Inner temperature of the unit is too cold.
Reason 1 Storage the unit in cold aria.
Solution Move the unit to warm aria.
Reason 2 Temperature sensor error.
Solution Please ask to HODAKA CO., LTD. for inspection.



Condition Sensor error
Reason 1 It is sensor life
Solution Please ask to HODAKA CO., LTD. for inspection.
Reason 2 The unit has been stored without operation.
Solution Charge battery and re-start.
Reason 3 Zero setting have done in flue gas.
Solution Do zero setting again in ambient air.

＊Left window is the sample of O2 sensor error.

13. Guarantee

Guarantee period : 12months from date of dispatch.
Guarantee: During guarantee period, if your instrument brakes down although correct usage based on this user manual, we will repair it by free of charge. In case you have trouble, firstly please contact to HODAKA CO., LTD. (+81-(0)6-6922-5501), then send your instrument to HODAKA CO., LTD. International transportation cost is not include in guarantee.

HODAKA CO., LTD shall not be liable for any loss or damage whatever arising from content errors or any mis-use of this instrument.

HODAKA CO., LTD.
1-6-17 Asahiku Takadono Osaka Japan 535-0031
TEL: +81-(0)6-6922-5501
FAX: +81-(0)6-6923-1617

Traceability certification can be issued at HODAKA. (Additional cost will be required)