

# Flue Gas Analyzer HT-1300N

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## Operating Manual



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## 2. Introduction

### 2.1 The flue gas analyzer HT-1300N

The Flue Gas Analyzer HT-1300N is used for the following purposes :

- Precise control and adjustment measurement for gas and oil firings
- Inspection of gas firing locations
- Control of modern combustion boilers.

### 2.2 Important Instructions regarding the Operating Manual

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

Therefore, every user is obliged to read carefully the operation manual and to strictly observe all instructions regarding safety.

Additional instructions in other chapters are marked through **Caution** signs.

## 3. Safety Regulations

The following Safety instructions have to be strictly observed.

They are an essential and indispensable part of the user documentation.

Not observing can mean loss of warranty claims.

### 3.1 Safety Instructions

- The device -1300N is only to be used for its indicated purpose : the measurement of flue gases, of combustion air and gas temperature .

### 3.2 Specific Safety Instructions

- The device is only to be used with the supplied AC Adapter (HT1301) for power supply.

Should the battery catch fire due to an operating error or a technical defect, the fire should only be extinguished with the corresponding fire extinguishing equipment.

- The metal tube of the probe as well as any other metal parts / accessories are not to be used as electric conductors.
- The device is not to be used in and under water.
- The device is not to be placed near or directly at open fire or heat.
- The indicated range of temperature of the probe is not to be exceeded, as the probe, temperature sensory mechanism and sensor could be destroyed.
- Plunges of the electronic measuring device have to be avoided.
- **Caution:** Moisture, being evacuated out of the condensate trap can be slightly acidic.

In case of skin contact **IMMEDIATELY:** clean respective parts of the body!

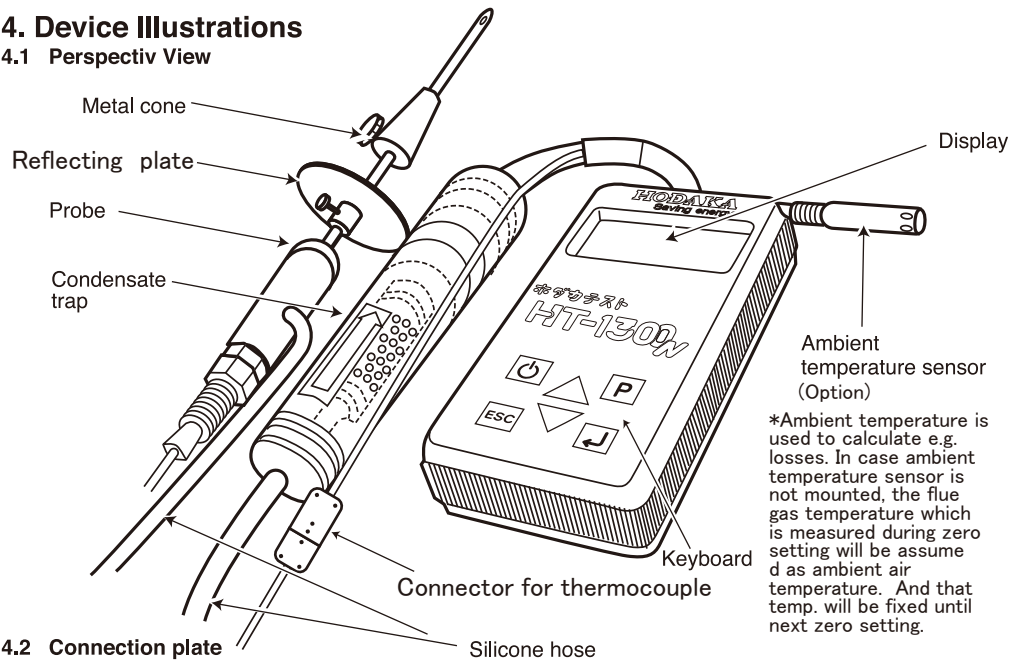
Avoid contact of eyes with liquid!

- **After measurement, vent the device with fresh air** and see to it that the **probe is** getting cold. As long as it is hot, the tube of the probe could burn persons or cause fire damages on inflammable underground.

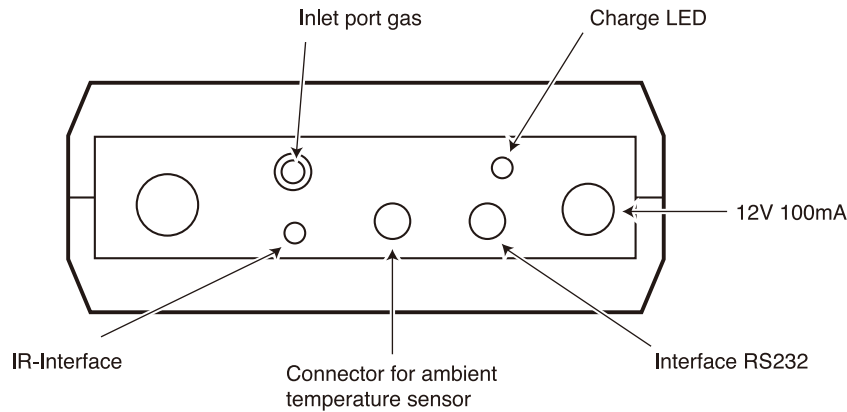
- The exhalations of alcoholic combinations (f. ex. attenuation, petrol, spirit, varnish...) may be damage the sensors of the analyzer. Therefore it' s forbidden to preserve or use these fluids near by the device.

4. Device Illustrations

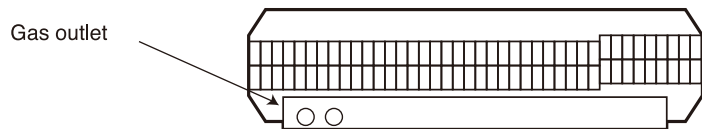
4.1 Perspectiv View



4.2 Connection plate

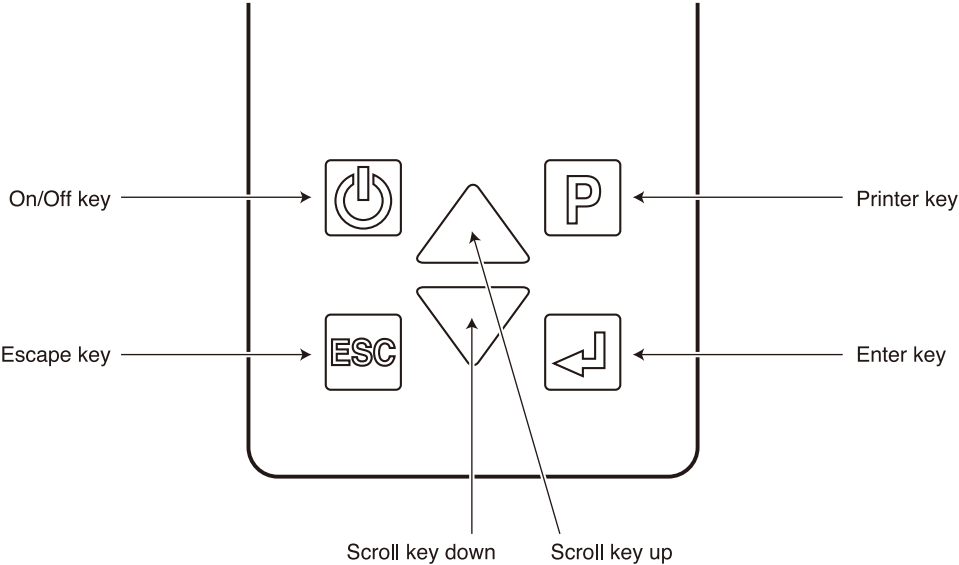


4.2 Lower part



Exhusted gas from the gas outlet port might include toxic components.  
Do adequate ventilation.

4.4 Keyboard



:switch device on/off



:start the function selected by the cursor



:change value, move cursor or choose a selection



:activate print-out



:end or back to the previous menu

## 5. Power supply

HT-1300N can be operated by:

1. HT-internal battery (standard scope of supply)
2. HT-battery charge (standard scope of supply) 100 V / 12 Vdc / 100 mA

**Measurements from line power:** Use the HT-1300N only with the HT power supply  
100 V / 12Vdc / 100 mA

### 5.1 Prepare measurement

The HT-battery charger can be connected to the HT-1300N.

Charge battery . . .  
75.3%

At the connection plate the charging-LED lights up.  
On the display the current loading-state of the battery is displayed.  
If the battery is fully charged, the HT-1300N changes to trickle charge and the LED blinks approx. every 16 seconds.  
The charging time for unloaded battery is approx. 12 hours.

- **ATTENTION: No battery charge if the unit is switched ON. (measurement)**
- **For battery charge, the device has to be switched OFF and the HT battery charger has to be connected to the HT-1300N and the mains power supply.**
- **Also in case of non-use charge battery once in the month.**

Operating temperature (0°C to 45°C)

Condensate trap

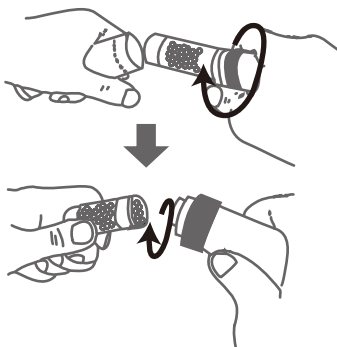
- Mount condensate trap with filter (Filter is above).
- Please check, if the condensate trap is empty and the filter is still **white**.
- Check all plugged and screwed connections regarding their tight and correct fit.  
Check tightness of all tubes, tube connections and condensate trap (from probe tip to gas connection on device).

#### Exchange filter



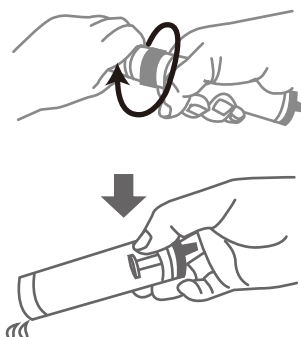
White = ready for operation.  
Dark = replacement is necessary.

#### Exchange silica gel



Blue = ready for operation.  
Pink = replacement is necessary.

#### Condensate cleaning



Remove the cover then clean the condensate in the trap.

### 5.2 Interface RS 232

Switch off unit before connecting RS 232 cable to PC!

## 6. Operating

### 6.1 Switch ON the unit

By pressing the -key the HT-1300N will be switched ON.

HODAKA  
HT-1300N

Selftest follows. Then the program type will be selected by the arrow keys or .

HT-1300N  
-Selftest-

Zero setting  
has to be  
determined in  
ambient air!

Programtype :  
Program1  
Program2

The selection of the fuel follow and the information window about parameters of the selected fuel.

13A  
6C  
LPG  
Keros

13A  
CO2max : 12.2%  
COmax : 4000ppm  
O2Ref : 0 ↓ ↑

( Fuel:13A,6C,  
LPG,Keros,  
L-oil,A,C,  
Pellet )

The O2 ref. is variable  
by means of or .

After the selection of program type and fuel the zero setting follows.

Zero setting  
please wait

After zero setting the unit enters the main menu.

Gas measurement   
View last values  
Zero setting  
Extension menu

The residual battery capacity is displayed in the right corner of the LCD.

O2 20.9%  
CO 0ppm  
CO/O2 ---ppm  
CO2 0.0%

During the measurement, press : Pump off ( Temp. measurement will be continued)  
During the pump off, press : Pump in (Gas measurement starts again)

During the pump on, press 2times : Back to the main menu.  
During the pump off, press 1time : Back to the main menu.

Switch off the unit:

Back to the main menu.

Turn off the unit.

## 6.2 Gas measurement

Gas measurement
View last values
Zero setting
Extension menu

Programtype :
Program1
Program2

▲ or ▼ : Select the program type  
 ⏎ : Confirmation of the selection  
 ESC : Back to the main menu

13A
6C
LPG
Keros

▲ or ▼ : Select the fuel  
 ⏎ : Confirmation of the selection

13A
CO2max : 12.2%
COmax : 4000ppm
O2Ref : 0 ↓ ↑

The stored parameters of fuel are displayed.  
 The O2 ref. is variable by means of ▲ or ▼ .

⏎ : Start measurement  
 ▲ or ▼ : Scroll the measuring values (page1 to page 4)

T-Gas 120.1°C	T-Amb 24.3°C	ExcAir 1.31	CO/O2 175mg
O2 4.9%	CO/0% 164ppm	Losses 5.0%	O2 4.9%
CO 125ppm	CO/O2 175mg	Effic. 95.0%	CO 125ppm
CO2 10.8%	CO/m3 156mg	Dewpnt. 72°C	CO2 10.8%

⏎ : Input T-Boiler

**The functions "Input of T-Boiler" and "Input Soot number" has to be activate in the Extension Menu / Device settings/ Parameter / Print / store boiler temp and print / store soot number! (see chapter)**

T-Boiler/Soot
T-Boiler 95°C

▲ or ▼ : Input Boiler temperature in 5°C steps  
 ESC : Back to measurement

⏎ : Input of T-Boiler and Soot number by means of ▲ or ▼ .

Note: The input mask soot number and derivate is valid only at oil as fuel.

Soot1 :	2
Soot2 :	3
Soot3 :	1
only	negative

▲ or ▼ : Input soot number in 1 steps  
 ⏎ : Line transfer  
 ESC (in line 1): Back to input T-Boiler  
 ⏎ (in line 4): Storage

Print
Store
Abort

P : Print-out  
 ⏎ : Storage  
 ESC : Back to main menu

The last selected storage space is selected.

Store measurement
Cust.1
10.01.'03 08 : 11
P1

▲ or ▼ : Selection of storage place  
 ⏎ : Storage  
 ESC : Back to measurement

If the selected storage place is free, the display announce: "free"

### Adjustment of the measurement variables:

Press ▲ and ▼ for 3 seconds simultaneous, until beeper is heard

T-Gas	120.1°C
O2	4.9%
CO	125ppm
CO2	10.8%

▲ or ▼ : Move cursor  
 ⏎ or ESC : Change fuel  
 ▲ and ▼ : Back to measurement and leave measurement configuration

## 6.3 Last values

Gas measurement
View last values
Zero setting
Extension menu

⏎ : View last values

T-Gas 120.1°C	T-Amb 24.3°C	ExcAir 1.31	CO/O2 175mg
O2 4.9%	CO/0% 164ppm	Losses 5.0%	O2 4.9%
CO 125ppm	CO/O2 175mg	Effic. 95.0%	CO 125ppm
CO2 10.8%	CO/m3 156mg	Dewpnt. 72°C	CO2 10.8%

▲ or ▼ : Scroll the measuring values (page1 to page 4)  
 ⏎ : Draft measuring or input of T-boiler and soot numbers  
 ESC : Back to the main menu

T-Boiler/Soot
T-Boiler 95°C

▲ or ▼ : Input of T-boiler ( 5°C steps )  
 ESC : Back to the menu "View last values"

After confirmation by means of the ⏎ the input of soot numbers and derivate follows with ▲ or ▼

Soot 1 :	2
Soot 2 :	<b>3</b>
Soot 3 :	1
oily	negative

▲ or ▼ : Input soot number in 1 steps  
 ⏴ or ⏵ : Line transfer  
 ⏴ (in line 1): Back to input T-Boiler  
 ⏴ (in line 4): Storage

Print	
Store	⏴
Abort	ESC

P :Print-out  
 ⏴ :Storage  
 ⏴ :Back to main menu

▲ or ▼ : Selection of the storage place for the last values.

#### 6.4 Zero setting

Gas measurement
View last values
<b>Zero setting</b>
Extension menu

Zero setting please wait
-----------------------------

Zero setting has be determined in ambient air!
---

⏴ : Zero setting

#### 6.5 Extension menu

Gas measurement
View last values
Zero setting
<b>Extension menu</b>

▲ or ▼ : Select the function

Stored data	■
Device settings	
Service	
Set CO alarm	

Stored data	■
<b>Device settings</b>	
Service	
Set CO alarm	

Stored data	■
Device settings	
<b>Service</b>	
Set CO alarm	

Stored data	■
Device settings	
Service	
<b>Set CO alarm</b>	

⏴ : Start the function

#### 6.5.1 Srtored data

##### 6.5.1.1 View stored data

<b>Stored data</b>	■
Device settings	
Service	
Set CO alarm	

<b>View stored data</b>	■
Delete data	
Measurem.HT=>PC	

▲ or ▼ :Select the function  
 ⏴ :Start the function

Memory info	
occupied :	1
available :	99
Total :	100

▲ or ▼ :Selection of storage  
 ⏴ :Confirmation

The storage places marked with \* are occupied.

Cust.1	*
Cust.2	
Cust.3	
Cust.4	

▲ or ▼ :Select customer  
 ⏴ :Activate storage place

In the last display line it is indicated which measurements are set aside for the selected customer. This case program 1.

▲ or ▼ : Scroll the stored values (page1 to page 4)

P :Print-out

T-Gas	120.1°C
O2	4.9%
CO	125ppm
CO2	10.8%

T-Amb	24.3°C
CO/0%	164ppm
CO/O2	175mg
CO/m3	156mg

ExcAir	1.31
Losses	5.0%
Effic.	95.0%
Dewpnt.	72°C

CO/O2	175mg
O2	4.9%
CO	125ppm
CO2	10.8%

#### 6.5.1.2 Delete data

View stored data
<b>Delete data</b>
Measurem.HT=>PC

▲ or ▼ :Select the function  
 ⏴ :Start the function

Memory info	
occupied :	1
available :	99
Total :	100

Current use of storage

Delete data?
No
<b>Yes</b>

▲ or ▼ :Select the function  
 ⏴ :Start the function

Delete stored measurement
<b>Single delete</b>
Delete All

▲ or ▼ :Select the function  
 ⏴ :Start the function

Cust.1	*
Cust.2	
Cust.3	
Cust.4	

▲ or ▼ :Select the function  
 ⏴ :Start the function

Data bloc  
was delete . . .

With selection of "ALL" the complete  
memory is deleted

6.5.1.3 Measurement HT-1300N to PC

View stored data  
Delete data  
Measurem.HT=>PC

▲ or ▼ :Select the function  
⏏ :Start the function

1  
Measurements  
available  
to transmit

⏏ :Number of data to be transmitted

Transmission  
to the PC?  
Continue  
Abort

Activate PC-program for transmission.

Deleate data?  
No  
Yes

After occurred data transfer appears :  
Memories delete No or Yes

6.5.2 Device settings

Stored data  
Device settings  
Service  
Set CO alarm

▲ or ▼ :Select the function  
⏏ :Start the function

Set time and data  
Parameter  
Service menu

Set time and data  
Parameter  
Service menu

Set time and data  
Parameter  
Service menu

6.5.2.1 Date / Time

Date Time  
13.01.'03 10:51:10

⏏ :The time stored in the HT-1300N and  
the date is displayed.

Date Time  
13.01.'03 10:51:10  
▲  
▼

⏏ :Activate cursor and placing through  
repeated pressing about the digit to be changed  
▲ or ▼ : Change value  
ESC : Back to the menu "Device settings"

6.5.2.2 Parameter

Set time and data  
Parameter  
Service menu

▲ or ▼ :Select the function  
⏏ :Start the function

LCD-Contrast  
Contrast 29%  
▲  
▼

Window :  
Page 4  
▲  
▼

Current language :  
English  
▲  
▼

Print/store  
boiler temp.? Yes  
▲  
▼

Print/store  
soot number? Yes  
▲  
▼

▲ or ▼ :Change value / Language / Setting  
⏏ :Back to the menu "Parameter"

6.5.3 CO-alarm

Stored data  
Device settings  
Service  
Set CO alarm

⏏ :Set CO alarm

CO warn limits ppm  
Program1 2000  
Program2 2000

▲ or ▼ : change CO threshold values  
⏏ :Confirmation CO alarm  
ESC :Back to "Extension menu"

In the gas measurement a warning appears if the threshold value is exceeded.



## 7. Calculation basis

### 7.1 Analysis and calculation

Continuously measured items	Unit
O <sub>2</sub>	[%]
Air temperature	[°C]
Flue gas temperature	[°C]
CO	[ppm]

Via the microprocessor the following is calculated (standard and optional):

More continuously calculated measuring items	Unit
CO <sub>2</sub>	[%]
Efficiency	[%]
Losses	[%]
Excess Air	-
CO value in reference to 0% rest O <sub>2</sub> (not diluted)	[ppm]
CO value in reference to O <sub>2</sub> reference value dep. on fuel	[ppm]
Dew point	[°C]

$$\text{Excess Air } (\lambda) = \frac{20.9}{20.9 - \text{O}_2 \text{ in the flue gas}}$$

$$\text{Losses} = \frac{(\text{GO} + (\lambda - 1) \times \text{AO}) \times 0.33 \times (\text{Flue gas temperature (T)} - \text{ambient temperature (t)}) \times 100}{\text{Calp}}$$

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

$$\text{CO}_2 = \frac{\text{CO}_2 \text{Max} \times (20.9 - \text{O}_2 \text{ in the flue gas})}{20.9}$$

$$\text{CO/O}_2 = \frac{20.9 - \text{O}_2 \text{ reference \%}}{20.9 - \text{O}_2 \text{ in the flue gas}} \times \text{CO}$$

$$\text{Dew point} = \frac{4077.9}{16.7241 - \ln \left( 1.1 + \frac{100}{1 + \frac{fw}{\text{CO}_2}} \right)} - 236.67$$

	GO Nm <sup>3</sup>	AO Nm <sup>3</sup>	Calp kcal/Nm <sup>3</sup> or kg	CO <sub>2</sub> Max	fw
13A	12.04	10.95	9940 kcal/Nm <sup>3</sup>	12.2	57
6C	4.89	4.08	4050 kcal/Nm <sup>3</sup>	13.1	77
LPG	25.9	23.9	22350 kcal/Nm <sup>3</sup>	13.8	77
Keros	12.15	11.37	10570 kcal/kg	15.1	111
L-Oil	11.9	11.15	10280 kcal/kg	15.4	111
A	11.37	10.68	10160 kcal/kg	15.8	111
C	10.88	10.25	9750 kcal/kg	16	111
Pellet	4.63	4.63	4200 kcal/kg	20.3	0

GO:Theoretical flue gas volume  
AO:Theoretical air volume  
Capl:Lower calorific value

CO<sub>2</sub>Max:CO<sub>2</sub>Max value of each fuel  
fw:humidity mark

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

## 8. Technical specifications

Flue gas analyzer ホダカデスト® HT-1300N				
Measurement	O <sub>2</sub>	Measurement range	0~20.9 vol.1%	
		Accuracy	Less than ± 0.2 vol.1%	
		Resolution	0.1%	
		Response	with in 10 sec.	
	CO (with H <sub>2</sub> compensation)	Measurement range	0~10000ppm	
		Accuracy	Measurement = 0~200 ppm : less than ±10ppm Measurement = 200ppm~ : less than ±5% of measured value	
		Resolution	1ppm	
		Response	with in 40 sec.	
	Combustion air temp.	Measurement range	0 ~ 650℃ 0 ~ 1100℃ (depend on probes)	
		Accuracy	±1℃ or ±1% reading(0 ~ 650℃) ± 2 % reading (650.1 ~ 1100℃)	
		Resolution	0.1℃ (0 ~ 999.9℃) 1℃(1000 ~ 1100℃)	
		Ambient air temp.	Measurement range	0~100℃
Accuracy	Less than ±1℃			
Resolution	0.1℃			
Calculated values	CO <sub>2</sub>		0~CO <sub>2</sub> Max%	
	O <sub>2</sub> / CO (O <sub>2</sub> =0%)	0~Calculated value ppm		
	O <sub>2</sub> / CO (O <sub>2</sub> =7%)	0~Calculated value ppm		
	Excess air	1.0~50.0		
	Losses	0~100%		
	Efficiency	0~100%		
	Dewpoint	0~100℃		
Fuel	13A, 6C, LPG, Kerosine, Light oil, Heavy oil, Heavy A, Heavy C, Pellet			
Sensor	O <sub>2</sub>	Electrochemical sensor		
	CO(with H <sub>2</sub> compensation)	Electrochemical sensor		
	Combustion air temp.	K thermocouple		
	Ambient air temp.	Pt 2000 Ω		
Operating and storage temperature		Operating:0℃~+45℃	Storage:-20℃~+60℃	
Display		Dot matrix		
Data store		100data		
Power supply		International NiCad battery 6V and line power (AC100~240V 50/60Hz DC12V 2700mA) min 8hours with full charged battery		
Dimension		80×150×35mm		
Weight		Main unit approx. 0.36Kg		
Standard equipment	Built in	Pump, Interface for PC (RS232) Data logger (possible to store 100 data), interface for printer		
	Accessories	Battery charger, gas sampling probe, ambient air temp. sensor, reflecting plate, carrying case, softcase		
		Description	Art. No.	
Optional items	*Sampling probe with K thermocouple		HT-1006	L=180mm φ5 0~650℃
	Probes for flue gas			
			HT-1001A	Sampling probe L=300mm φ6 0~650℃
			HT-1006L	L-shape probe L=120mm φ6 0~650℃
	Probe handle			
	Probe handle		HT-7201A	with hose/condensate trap
	Probe tube(for probe handle HT-7201G)			
	Probe tube (with flue gas temp. sensor)		HT-7231	L=180mm φ5
			HT-7232	L=750mm φ6
			HT-7233	L=750mm φ8
		Probes for temperature	K thermocouple	HT-1251a
	HT-1252a			φ1.5×130L 0~950℃, for air /liquid
	HT-1253a			φ3×130L 0~400℃, for air /liquid/foods,centric top
	HT-1254a			130L 0~400℃, for surface/rifts/air /liquid
	HT-1255a			φ4×130L 0~650℃, for surface/rifts/air /liquid
	HT-1256a			0~450℃, magnetic probe for surface
	HT-1257a			0~180℃, Pliers probe for plates, tube
	Air temp. sensor		HT-1382	0~100℃, for air temp.
	Ambient air temp. sensor		HT-1321	0~100℃
	Battery charger		HT-1318	AC100~240V
	Hard case		HT-1315	Aluminum, dimentino: 350×460×155 weight : 2.9kg
	Measurement software		HT-2094	Online View 2000(OS Windows XP/7) with RS232cable
	Measurement software		HT-2084	Online View 2000(OS Windows XP/7)with RS232cable,USBcable
	Infrared printer		HT-1610	with roll paper×1 , AAbattery x 4
	Roll paper for infrared printer		HT-1636	5rolls

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



## 9. Storage

### 9.1 Operating and storage temperature

Operating temperature: 0° C to 45° C

Storage temperature: -20° C to +60° C.

Long term non-operating and storage:

1. charge battery every 3 weeks at the line power

2. store in a dry place

Recommendation:

Discharge battery before charging (turn power on of unit and wait until auto shut-down before charging)



## 10. 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 contact to HODAKA CO., LTD. (TEL +81-(0)6-6922-5501 / E-mail: info@hodaka-inc.co.jp )

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 misuse of this instrument.

HODAKA CO., LTD.

1-6-17 Asahiku Takadono Osaka Japan 535-0031

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

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