NDIR CH4 sensor CU-1000 UART Communication protocol

Digital output Communication protocol

Summary:

1. The data in the explanation are all hex data. Such as 46 is hexadecimal [70]

2. [xx] is single byte data(no symbol,0-255) ;(xx) is double byte data, signed integer (-32768 to +32767),the top one is ahead. "—— " followed by explanation;

3. All the data are integer. It has (100,10,1) times relationship with true data.

4. The length of command byte is [LB]+3.

Command Format:

Send：   [IP] [LB] [CMD] [DF] [CS]

[IP]   address（fixed as 11）。

[LB]   byte length followed does not include CS

[CMD]   command

[DF]   parameter items with command, optional

[CS]   CS= － （IP +LB+CMD +DF）

Response：

a．When the command is implemented correctly, it responses

[ACK] [LB] [CMD] [DF] [CS]

[ACK]=0X16 right command

[LB]   byte length followed does not include CS

[CMD]   command

[DF]   parameter items with command, optional

[CS]   CS=－ （ACK +LB+CMD+DF）

b．When the command is not implemented correctly, it responses

[NAK] [LB] [CMD] [EC] [CS]

[NAK]=0X06   Command is not implemented correctly

[LB]=2   byte length followed does not include CS

[CMD]   command

[EC]   the error code that command is not implemented correctly

[CS]   CS= － （NAK +LB+CMD+DF）

[EC]

1   Order length is wrong

2   The command is not correct

3   Can't implement this command under current status.

Function list

No	Function	CMD	Description
1	measuring results check	0x01	Besides measuring data, it also has status information
2	Close the light source		
3	Open the light source		
4	Zeroing	0x03	
5	Calibration		
5.1	zero calibration	0x4B	
5.2	span calibration	0x4C	
6	Reset to factory model	0x4D	
7	software version check	0x1E	
8	sensor serial No. check	0x1F	

1. Look up measurement result

Send: 11 01 01 ED

Response: [ACK] 05 01 [DF1] [DF2] [ST1] [ST2] [CS]

Remarks:

1).Gas concentration =（DF1*256+ DF2）/ 100

2).[STx] is reserved.

2. Close the light source

Send: 11 02 08 01 E4

Response: 16 02 08 01 DF

Remark: The sensor is in measurement process after power on,when you need to close the light source, please use this command to the sensor.

3. Open the light source

Send: 11 02 08 00 E5

Response: 16 02 08 00 E0

Remark: When you need to open the light source and begin the measurement, please use this command to the sensor.

4. Zeroing

Send: 11 01 03 EB

Response: [ACK] 01 03 [CS]

Remark: Stream N2 for over 30s then send the zeroing command to the sensor.

5. Calibration

We suggest to perform calibration to the sensor in application when it has drift problem.

The calibration method is as below:
Send: 11 04 **4B** 00 [DF1] [DF2] [CS]
Response: [ACK] 01 **4B** [CS]
Remark:
Gas concentration = （DF1*256+ DF2）／100
Span calibration (4C): the same as zero calibration but to replace 4B by 4C.

Note : We suggest to perform zero and span calibration together to ensure its accuracy, below is the example of zero calibration and span calibration.

5.1. Zero calibration （**4B**）
Send: 11 04 **4B** 00 00 00 A0
Response: [ACK] 01 **4B** [CS]
Remark:
Before sending zero calibration command, please inlet N2 into the sensor over 2mins .

5.2. Span calibration
Send: 11 04 **4C** 00 01 F4 AA
Response: [ACK] 01 4C [CS]
Remark:
Before sending span calibration command, please inlet 5% VOL CH4 into the sensor over 2mins .

Note :
1:After zero calibration is done, please do span calibration immediately. Zero calibration and span calibration should be perfomed together.
2: If you would like to calibrate in the middle point, please calibrate the zero point and middle point together to ensure its accuracy.

6. Calibration data reset

Send: 11 02 4D 00 [CS]
Response: [ACK] 01 4D [CS]
Remark:
Remove users calibration data and reset to factory calibration data .

7. Software version check

Send: 11 01 1E D0

Response: [ACK]   [LB] 1E [CH1] [CH2] [CH3] [CH4] [CH5] …….[CHx] [CS]

Remark:

1: [CHx] is ASCLL II code.

2: LB is bite length, LB= X+1

Example of response : 16 0E 1E 53 65 6E 73 6F 72 2D 36 2E 31 35 5F 31 BD

8. Series number check

Send: 11 01 1F CF

Response: [ACK] 0B 1F [SN1] [SN2] [SN3] [SN4] [SN5] [CS]

Remark:

[SNn] is from 0-9999, five integer consists of 20 bits series number

Example of response: 16 0B 1F 07 0E 00 96 0C E4 23 35 00 00 CD

Failure output pattern analysis

The sensor will begin the measurement after it is power on and warm up, then the user can get the CH4 concentration value through digital output and voltage output.

Different voltage output means CH4 sensor is in different status.The detailed description is as below :

U_O voltage output	Description
0V	When the voltage output is 0V, the sensor malfunctioned.
0.2V	When the voltage output is 0.2V, the sensor was still in warm-up process.
0.4V	When the voltage output is 0.4V,the sensor measurement value is 0.
2V	When the voltage output is 2V,the sensor measurement value should be full scale value.
2.2V	When the voltage output is 2.2V,the sensor measurement value should be full scale value.