I²C Protocol

For Laser Particle Sensor Module PM2105

1. Brief introduction

This is an I²C protocol for PM2105. The sensor module is lower computer, which is not able to initiate communication automatically. Communication is initiated via main controlled board, which reads data and sends control commands.

Communication clock frequency <=100Khz

2. Communication common description

- **START:** start signal, send by main controlled board;
- **STOP:** stop signal, send by main controlled board;
- **ACK:** acknowledge signal, send by the sensor module if in bold; otherwise, send by main controlled board;
- **NACK:** non-acknowledge signal, send by the sensor module if in bold; otherwise, send by main controlled board;
- **Px:** receive and send data; send by the sensor module if in bold; otherwise, send by main controlled board.

3. Protocol detailed description

3.1 Send command data

Send by main controlled board:

START+WRITE+**ACK**+P1+**ACK**+P2+**ACK……** +P7+**ACK**+STOP

Data	Byte content	Description
Device address	Sensor address and read/write command	This byte is 0x50 when write data
P1	0x16	Frame header
P2	Frame length	Number of byte, not including length of device address (From P1 to P7, 7 bytes in total)
P3	Data 1	Control command of the sensor as: Close measurement: 1 Open single measurement: 2 Set up continuously measurement: 3 (default mode) Set up timing measurement: 4 Set up dynamic measurement: 5 Set up calibration coefficient:6
P4	Data 2, high byte	Measuring time: (range: 180~64800) unit: second It should be 0xFF 0xFF when setting up continuously measurement here. Calibration coefficient:(Range: 70~150, Corresponding: 0.7~1.5）
P5	Data 2, low byte	
P6	Data 3	Reserved
P7	Data check code	Check code= (P1^P2^……^P6)

3.2 Read data command

Send by main controlled board:

START+READ+**ACK**+**P1**+ACK+**P2**+ACK+……+**P32**+NACK+STOP

Data	Byte content	Description
Device address	Sensor address and read/write command	This byte is 0x51 when read data.
P1	0x16	Frame header
P2	Frame length	Number of byte, not including length of device address (from P1 to P32, 32 bytes in total)
P3	Sensor status	Close: 1: fault 2: testing 3: Data stable: 0x80 Other data is invalid.(Check 3.3 detailed introduction for every kinds of measurement mode)
P4	Data 1, high byte	The measuring mode of sensor as: Single measuring mode: 2 Continuous measuring mode: 3 Dynamic measuring mode: 5 Timing measuring mode: >= 180 (means measuring time)
P5	Data 1, low byte	
P6	Data 2, high byte	Calibration coefficient:(Range: 70~150, Corresponding: 0.7~1.5）
P7	Data 2, low byte	
P8	Data 3, high byte	PM1.0 concentration , unit: ug/m3，GRIMM
P9	Data 3, low byte	
P10	Data 4, high byte	PM2.5 concentration , unit: ug/m3，GRIMM
P11	Data 4, low byte	
P12	Data 5, high byte	PM10 concentration , unit: ug/m3，GRIMM
P13	Data 5, low byte	
P14	Data 6, high byte	PM1.0 concentration , unit: ug/m3，TSI
P15	Data 6. low byte	
P16	Data 7, high byte	PM2.5 concentration , unit: ug/m3，TSI
P17	Data 7, low byte	
P18	Data 8, high byte	PM10 concentration , unit: ug/m3，TSI
P19	Data 8, low byte	
P20	Data 9, high byte	Number of PM0.3, unit: pcs/0.1L
P21	Data 9, low byte	
P22	Data 10, high byte	Number of PM0.5, unit: pcs/0.1L
P23	Data 10, low byte	
P24	Data 11, high byte	Number of PM1.0, unit: pcs/0.1L
P25	Data 11, low byte	
P26	Data 12, high byte	Number of PM2.5, unit: pcs/0.1L
P27	Data 12, low byte	
P28	Data 13, high byte	Number of PM5.0, unit: pcs/0.1L
P29	Data 13, low byte	

P30	Data 14, high byte	Number of PM10, unit: pcs/0.1L
P31	Data 14, low byte	
P32	Data check code	Check code = (P1^P2^……^P31)

3.3, Description of every kinds of work mode

1, Single measuring mode

The sensor will start measuring particles after receiving command of opening measuring, sensor status is 3. Measured value of last measurement will be output automatically in preheating. After preheating for 6 seconds, current measured data will be output. Measurement is to be completed in 36s. Sensors situation change to 0x80. Means data is stable, close measurement automatically.

After delivering the command of opening measurement, the main control board will start sending command of reading data, read current measured value of particles and sensor situation. Sensor situation is 3 during the measuring. The situation changes to 0x80 after finishing measuring in 36s. The data showed right now is final measured value.

2, Continuously measuring

Continuously measuring mode, sensor situation is always 3 after powering on or turning to continuously measuring mode.

3, Dynamic measuring mode

After sensors are in dynamic measuring mode, start measuring every 1 minute. Measuring time is 6s (Situation is 3 during these 6s). If measuring data within the 6s is like last time measured data (Judge condition as follow), then measuring is close (situation changes to 1). Otherwise, the sensor will go ahead testing for another 30s (situation is 3 within the 30s).Situation will be 0x80 after measuring finished.

Conditions to start completed 36s measurement under dynamic working mode

1, Change range is ＞±10μg(When last measurement result ＜100ug/m3)

2, Change range is ＞±10%(When last measurement result ＞100ug/m3)

When dynamic measuring mode is open, there will be a completed 36s measurement after powered on. Then it starts measuring every 1 minute.

Each time when dynamic measuring mode is set, the sensor will start completed 36s measurement. Ensure it can output data in 8s.

4, Timing measuring mode

After timing measuring mode is set, starting a completed 36s measuring every XX second. Situation is 3 during the measuring. And situation will change to 0x80 after finishing 36s measuring.

Note: No matter which mode, sensors will close particle measuring after receiving the command of closing measuring. Sensor situation is 1.