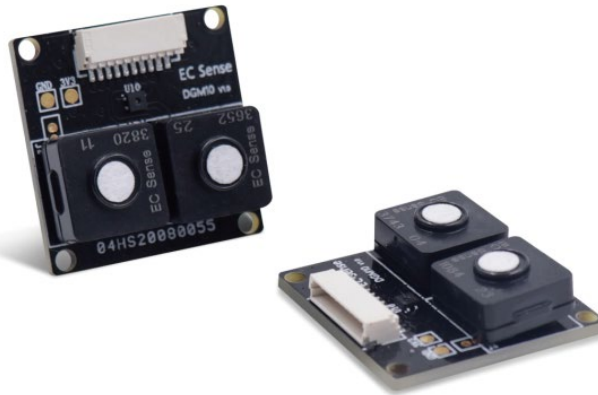




DGM10 Double Gas Sensor Module

UART Modbus-RTU & I²C Interface
Communication Protocol

This document describes the communication protocol of the UART and I²C Interface of the DGM10 Double Gas Sensor Module and the main commands during usage by the user in detail.

For detailed electrical parameters of DGM10 and usage methods of the product, please refer to the technical specifications and product manual.

1. UART Modbus-RTU Interface Communication Protocol

1.1 Communication Mode

DGM10 module uses UART (TTL) interface communication, please follow the parameters below:

Signal Voltage	Baud Rate	Data Bit	Stop Bit	Parity
3.3V	115200	8-bit	1	None

Adaptive baud rate operation: After powering on the device for 5 seconds, send two bytes of data 0x7F, 0x7F, and then send specific commands according to the communication protocol.

Note: If the two bytes 0x7F and 0x7F are not sent after power-on, or other data is sent, the adaptive baud rate may fail and the communication cannot be normal.

Currently, the supported adaptive baud rates are 115200, 57600, 19200, 9600, 2400

Transmission mode: Modbus-RTU Slave device address: 01 Read out and write data interval: ≥ 1s

The communication protocol uses all holding registers by three commands.

1) 03 (0x03) command: Read multiple holding registers

2) 06 (0x06) command: Write single holding register

3) 16 (0x10) command: Write multiple holding registers

The sensor module communication is the master to the slave mode. The master sends instructions for each data transmission and the slave transmits corresponding data according to the instructions.

1.2 Change Address

When modifying the product address of a sensor module, the address of a single product must be modified one by one, should not be modified at the same time.

Use a group of two commands to modify the modbus address. They must be sent in sequence, with an interval ≥ 1s.

The [addr] in the instruction is the modbus address that needs to be modified. Range: 01(0x01) ≤ addr ≤ 247(0xF7), the value out of range, the default is 01(0x01).

• Command 1

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x55	0x4E	0x4C	0x4F	0x43	0x4B	0x32	0x50

• Command 2

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]	Byte[8]	Byte[9]
0x4D	0x4F	0x44	0x49	0x46	0x59	0x00	addr	CRC_L	CRC_H

2. Sensor Type

The sensor gas type can be identified by read out from the holding register. Follow the Sensor Type code table below:

Gas Sensor	Formaldehyde	Organic Volatiles	Carbon Monoxide	Chlorine	Hydrogen	Hydrogen Sulfide	Hydrogen Chloride	Hydrogen Cyanide
Gas Formula	HCHO	VOC	CO	Cl ₂	H ₂	H ₂ S	HCl	HCN
Code	0x17	0x18	0x19	0x1A	0x1B	0x1C	0x1D	0x1E
Gas Sensor	Hydrogen Fluoride	Ammonia	Nitrogen Dioxide	Oxygen	Ozone	Sulfur Dioxide	Hydrogen Bromide	Bromine
Gas Formula	HF	NH ₃	NO ₂	O ₂	O ₃	SO ₂	HBr	Br ₂
Code	0x1F	0x20	0x21	0x22	0x23	0x24	0x25	0x26

Gas Sensor	Fluorine	Phosphine	Arsenide	Silane	Germane	Diborane	Boron Trifluoride	Hydrogen Selenide
Gas Formula	F ₂	PH ₃	AsH ₃	SiH ₄	GeH ₄	B ₂ H ₆	BF ₃	H ₂ Se
Code	0x27	0x28	0x29	0x2A	0x2B	0x2C	0x2D	0x31
Gas Sensor	Malodorous	Indoor Air Quality	Outdoor Air Quality	Non-Methane Total Hydrocarbons	Sulfide	Nitrogen Oxides	Nitric Oxide	Isobutylene
Gas Formula	SMELL	IAQ	AQI	NMHC	SO _x	NO _x	NO	C ₄ H ₈
Code	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Gas Sensor	Propylene Glycol	Methyl Mercaptan	Styrene	Tetrahydro-thiophene	Phosphorus Oxychloride	Phosgene	Ethylene Oxide	Trimethylamine
Gas Formula	C ₃ H ₈ O ₂	CH ₄ S	C ₈ H ₈	THT	POCl ₃	COCl ₂	C ₂ H ₄ O	C ₃ H ₉ N
Code	0x3A	0x3B	0x3C	0x3D	0x3E	0x3F	0x40	0x41
Gas Sensor	Dimethylamine	Ethanol	Carbon Disulfide	Ethyl Mercaptan	Dimethyl Disulfide	Ethylene	Methanol	Benzene
Gas Formula	C ₂ H ₇ N	C ₂ H ₆ O	CS ₂	C ₂ H ₆ S	C ₂ H ₆ S ₂	C ₂ H ₄	CH ₃ OH	C ₆ H ₆
Code	0x42	0x43	0x44	0x45	0x46	0x47	0x48	0x49
Gas Sensor	P-xylene	Toluene	Acetic Acid	Carbon Dioxide	Hydrogen Peroxide	Hydrazine	Unsymmetrical Dimethyl Hydrazine	
Gas Formula	C ₈ H ₁₀	C ₇ H ₈	CH ₃ COOH	ClO ₂	H ₂ O ₂	N ₂ H ₄	C ₂ H ₈ N ₂	
Code	0x4A	0x4B	0x4C	0x4D	0x4E	0x4F	0x50	
Gas Sensor	Trichloroethylene	Trichloromethane	Trichloroethane					
Gas Formula	C ₂ HCl ₃	CHCl ₃	C ₂ H ₃ Cl ₃					
Code	0x51	0x52	0x53					

2.1 Read-Out Measured Values

The group of addresses is used to read out measurement values (gas concentrations), temperature, humidity, sensor module range, sensor module gas type, operating light switch control, sensor lifetime and performance.

DGM10 Double Gas Module includes two gas sensors, which have their own position on the circuit board S0 and S1. Please see the table below:

Address	Data	Readout/Writing	Function	Description
0xF000	data[0]	Read & Write	Running light status	1: Open 0: Off
0xF001	data[1]	Only Read	Temperature	Type: 32-bit float type (data[1]<<16) data[2] Then convert according to the 32-bit float data type Unit: °C
0xF002	data[2]	Only Read		
0xF003	data[3]	Only Read	Humidity	Type: 32-bit float type (data[3]<<16) data[4] Then convert according to the 32bit float data type Unit: %RH
0xF004	data[4]	Only Read		
0xF005	data[5]	Only Read	S0 sensor detection result Gas concentration	Type: 32-bit float type (data[5]<<16) data[6] Then convert according to the 32bit float data type Unit: PPM (Oxygen: %vol.)
0xF006	data[6]	Only Read		
0xF007	data[7]	Only Read	S0 sensor maximum range	Type: unit 32 (data[7]<<16) data[8] Unit: PPM (Oxygen: %vol.)
0xF008	data[8]	Only Read		

Address	Data	Readout/Writing	Function	Description
0xF009	data[9]	Only Read	S0 sensors gas type	Type: uint 16 Please refer to <Table 1> for specific corresponding values
0xF00A	data[10]	Only Read	S1 sensor detection result Gas concentration	Type: 32-bit float type (data[10]<<16) data[11] Then convert according to the 32-bit float data type
0xF00B	data[11]	Only Read		Unit: ppm except Oxygen gas Oxygen Unit: %vol.
0xF00C	data[12]	Only Read	S1 sensor maximum range	Type: uint 32 (data[12]<<16) data[13]
0xF00D	data[13]	Only Read		Unit: ppm except Oxygen gas Oxygen Unit: %vol.
0xF00E	data[14]	Only Read	S1 sensors gas type	Type: uint 16 Please refer to <Table 1> for specific corresponding values
0xF00F	data[15]	Only Read	S0 Sensor Lifetime and Performance	Type: uint 16 2: Sensor failure, replace new sensor 1: Sensor is close to failure, prepare replacement 0 : Working
0xF010	data[16]	Only Read	S1 Sensor Lifetime and Performance	Type: uint 16 2: Sensor failure, replace new sensor 1: Sensor is close to failure, prepare replacement 0 : Working

• Example:

Read 0xF000 ~ 0xF010 instruction address

Downstream: Read out 17 registers data

Command Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x03	0xF0	0x00	0x00	0x11	0xB6(CRC_L)	0xC6(CRC_H)

Answer Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]	Byte[8]	Byte[9]	Byte[10]	Byte[11]	Byte[12]
0x01	0x03	0x22	0x00	0x01	0x41	0x9C	0x12	0x10	0x42	0x65	0xFB	0x00
Byte[13]	Byte[14]	Byte[15]	Byte[16]	Byte[17]	Byte[18]	Byte[19]	Byte[20]	Byte[21]	Byte[22]	Byte[23]	Byte[24]	Byte[25]
0x41	0xAC	0xF2	0x2A	0x00	0x00	0x00	0x32	0x00	0x22	0x41	0x10	0x87
Byte[26]	Byte[27]	Byte[28]	Byte[29]	Byte[30]	Byte[31]	Byte[32]	Byte[33]	Byte[34]	Byte[35]	Byte[36]	Byte[37]	Byte[38]
0x74	0x00	0x00	0x00	0x32	0x00	0x22	0x00	0x00	0x00	0x00	0xC9	0xD5

2.2 Control LED

One of the LEDs on the circuit board shows the working condition of the gas module. If you want to have less power consumption, the LED can be switched off.

• Example: Switch LED off or on

Downstream: Switch LED off, Write down 0 to 0xF000

Command Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x06	0xF0	0x00	0x00	0x11	0xB6(CRC_L)	0xC6(CRC_H)

Answer Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x06	0xF0	0x00	0x00	0x11	0xB6(CRC_L)	0xC6(CRC_H)

2.3 Read-Out Firmware Version

The firmware of the sensor module can be updated. If you want to get information, please follow the number in the Read-Out Firmware Version table below:

Address	Value	Readout/Writing	Function	Description
0xB000	'D' 'G'			
0xB001	'M' '1'			
0xB002	'0' ' '			
0xB003	'1' ' '			
0xB004	'1' ' '			
0xB005	'1' ' '	Only Read	Firmware Version Number	The Firmware version number, please refer to the read-out data
0xB006	'0' ' '			
0xB007	'2' '0'			
0xB008	'2' '0'			
0xB009	' ' '0'			
0xB00A	'8' ' '			
0xB00B	'2' '4'			

• Example:

Read 0xB000~0xB00B instruction address

Downstream: Get Gas Module Firmware Version number

Command Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x03	0xB0	0x00	0x00	0x0C	0xB6(CRC_L)	0xC6(CRC_H)

Answer Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]	Byte[8]	Byte[9]	Byte[10]	Byte[11]	Byte[12]
0x01	0x03	0x18	0x44	0x47	0x4D	0x31	0x30	0x5F	0x31	0x2E	0x31	0x2E
Byte[13]	Byte[14]	Byte[15]	Byte[16]	Byte[17]	Byte[18]	Byte[19]	Byte[20]	Byte[21]	Byte[22]	Byte[23]	Byte[24]	Byte[25]
0x31	0x2E	0x30	0x5F	0x32	0x30	0x32	0x30	0x2E	0x30	0x38	0x2E	0x32
Byte[26]	Byte[27]	Byte[28]										
0x34	0xC8	0x57										

2.4 Sleeping Mode

For less power consumption, please follow the table below to control the sensor module's sleep or awake mode. After entering the sleep mode, other commands will not be executed. For sending other commands you must exit the sleeping mode.

Address	Data	Readout/Writing	Register	Description
0xC000	data[0]	Only Read	Sleep status	Type: unit 16 1: Entry sleep mode 0: Exit sleep mode

• Command Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x06	0xC0	0x00	0x00	0x01	0xB6(CRC_L)	0xC6(CRC_H)

Answer Format (Going Sleeping Mode):

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x06	0xC0	0x00	0x00	0x01	0xB6(CRC_L)	0xC6(CRC_H)

Note: After entering the dormant state, sending other commands will not be executed and will be regarded as an invalid command until exiting the dormant state.

2.5 Sensor Serial Number

Each sensor has an independent number. DGM10 is a dual sensor module with two independent sensor serial numbers. Obtain the serial number of the sensor in the current module by reading the data in the following address:

Address	Data	Readout/Writing	Register	Description
0xB100	'1'	Only Read	S0 Sensor serial number	ascii code string Length: 16 bytes The specific sensor serial number, please refer to the read-out data
0xB101	'2'			
0xB102	'3'			
0xB103	'4'			
0xB104	'5'			
0xB105	'6'			
0xB106	'7'			
0xB107	'8'			
0xB108	'9'			
0xB109	'A'			
0xB10A	'B'			
0xB10B	'C'			
0xB10C	'D'			
0xB10D	'E'			
0xB10E	'F'			
0xB10F	'0'			
0xB110	'1'	Only Read	S1 Sensor serial number	ascii code string Length: 16 bytes The specific sensor serial number, please refer to the read-out data
0xB111	'2'			
0xB112	'3'			
0xB113	'4'			
0xB114	'5'			
0xB115	'6'			
0xB116	'7'			
0xB117	'8'			
0xB118	'9'			
0xB119	'A'			
0xB11A	'B'			
0xB11B	'C'			
0xB11C	'D'			
0xB11D	'E'			
0xB11E	'F'			
0xB11F	'0'			

- Read 0xB100~0xB10F instruction address
Downstream: Get the serial number of the sensor

Command Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x01	0x03	0xB1	0x00	0x00	0x10	0xB6(CRC_L)	0xC6(CRC_H)

Answer Format:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]	Byte[8]	Byte[9]	Byte[10]	Byte[11]	Byte[12]
0x01	0x03	0x20	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39	0x41
Byte[13]	Byte[14]	Byte[15]	Byte[16]	Byte[17]	Byte[18]	Byte[19]	Byte[20]	Byte[21]	Byte[22]	Byte[23]	Byte[24]	Byte[25]
0x42	0x43	0x44	0x45	0x46	0x30	0x30	0x31	0x32	0x33	0x34	0x35	0x36
Byte[26]	Byte[27]	Byte[28]	Byte[29]	Byte[30]	Byte[31]	Byte[32]	Byte[33]	Byte[34]	Byte[35]	Byte[36]		
0x37	0x38	0x39	0x41	0x42	0x43	0x44	0x45	0x46	0xDD	0xCA		

3. Re-calibration Sensor Module

If you want to calibrate the sensor module, please use the commands to modify. Separate operations are required when calibrating the zero point and span. First step is calibrate the zero point, second step is calibrate the span. When calibrating the zero point, it needs to be in clean air without the target gas and interfering gas, or use cylinder air or Nitrogen. When calibrating the span, it is necessary to use standard gas bottle with certification. The detailed operation, please refer to the DGM10 product manual.

Address	Data	Readout/Writing	Register	Description
0xC100	data[0]	Read & Write	Start S0 sensor Zero re-calibration	Start Zero re-calibration of S0 sensor by writing 1 Restore the factory Zero value of S0 by writing 0
0xC101	data[1]	Only Writing	Re-calibration zero value of S0 sensor	The current measurement value of the S0 sensor to be zero by writing 1, writing 0 is invalid value. When read out the zero value should be show 0 after successful zero calibration.
0xC102	data[2]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC103	data[3]	Only Read	Check S0 has zero re-calibration	Read out value is 1: S0 sensor had Zero re-calibration Read out value is 0: S0 sensor no Zero re-calibration
0xC104	data[4]	Read & Write	Start S0 sensor Span calibration	Start Span calibration of S0 sensor by writing 1 Restore the factory Span value of S0 by writing 0
0xC105	data[5]	Only Read	Check S0 has Span re-calibration	Read out value is 1: S0 sensor had Span re-calibration Read out value is 0: S0 sensor no Span re-calibration
0xC106	data[6]	Only Writing	Re-calibration Span value of S0 sensor	The current measurement value of the S0 sensor to be correct Span by writing 1, writing 0 is invalid value. The read-out value is 0 after successful Span re-calibration. The data type is float and the value must more than 0
0xC107	data[7]			
0xC108	data[8]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC109	data[9]			
0xC10A	data[10]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC10B	data[11]			
0xC10C	data[12]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC10D	data[13]			
0xC10E	data[14]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC10F	data[15]			

Address	Data	Readout/Writing	Register	Description
0xC110	data[16]	Read & Write	Start S1 sensor Zero re-calibration	Start Zero re-calibration of S1 sensor by writing 1 Restore the factory Zero value of S1 by writing 0
0xC111	data[17]	Only Writing	Re-calibration zero value of S1 sensor	The current measurement value of the S1 sensor to be zero by writing 1, writing 0 is invalid value. When read out the zero value should be show 0 after successful zero calibration.
0xC112	data[18]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC113	data[19]	Only Read	Check S1 has zero re-calibration	Read out value is 1: S1 sensor had Zero re-calibration Read out value is 0: S1 sensor no Zero re-calibration
0xC114	data[20]	Read & Write	Start S1 sensor Span calibration	Start Span calibration of S1 sensor by writing 1 Restore the factory Span value of S1 by writing 0
0xC115	data[21]	Only Read	Check S1 has Span re-calibration	Read out value is 1: S1 sensor had Span re-calibration Read out value is 0: S1 sensor no Span re-calibration
0xC116	data[22]	Only Writing	Re-calibration Span value of S1 sensor	The current measurement value of the S1 sensor to be correct Span by writing 1, writing 0 is invalid value. The read-out value is 0 after successful Span re-calibration. The data type is float and the value must more than 0
0xC117	data[23]			
0xC118	data[24]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC119	data[25]			
0xC11A	data[26]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC11B	data[27]			
0xC11C	data[28]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC11D	data[29]			
0xC11E	data[30]	Unreadable & writable	Retain	When read out the Retain value is 0, Unwritable
0xC11F	data[31]			

» 4. I²C Interface Communication Protocol

The description of DGM10 Double Gas Sensor Module I²C interface. Please make sure you have the right connection according to the Datasheet, since there are two connections, UART and I²C interface, available.

4.1 Communication Mode

DGM10 module uses UART (TTL) interface communication, please follow the parameters below:

Signal Voltage	I ² C 7bit Address	Protocol Speed	Readout between Writing and Waiting Time
3.3V	0x50	I ² C Standard mode, maximum clock frequency of 400 kHz	≥ 1s

Note: Between the write-command and the I²C readout value from the gas module, a minimum waiting time of 1s is required. However, it is recommended to wait longer than 1s.

4.2 Address Change

Use two commands to change the Modbus address and they must be sent in sequence, with an interval ≥1s.

The I2C of the 7-bit address range: 0x08 ~ 0x7F

• First Command

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x55	0x4E	0x4C	0x4F	0x43	0x4B	0x32	0x50

• Second Command

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]	Byte[8]	Byte[9]
0x49	0x32	0x43	0x41	0x44	0x44	0x52	addr	CRC_L	CRC_H

5. Sensor Type

The sensor gas type can be identified by read out from holding register. Follow the sensor type code table below:

Gas Sensor	Formaldehyde	Organic Volatiles	Carbon Monoxide	Chlorine	Hydrogen	Hydrogen Sulfide	Hydrogen Chloride	Hydrogen Cyanide
Gas Formula	HCHO	VOC	CO	Cl ₂	H ₂	H ₂ S	HCl	HCN
Code	0x17	0x18	0x19	0x1A	0x1B	0x1C	0x1D	0x1E
Gas Sensor	Hydrogen Fluoride	Ammonia	Nitrogen Dioxide	Oxygen	Ozone	Sulfur Dioxide	Hydrogen Bromide	Bromine
Gas Formula	HF	NH ₃	NO ₂	O ₂	O ₃	SO ₂	HBr	Br ₂
Code	0x1F	0x20	0x21	0x22	0x23	0x24	0x25	0x26
Gas Sensor	Fluorine	Phosphine	Arsenide	Silane	Germane	Diborane	Boron Trifluoride	Hydrogen Selenide
Gas Formula	F ₂	PH ₃	AsH ₃	SiH ₄	GeH ₄	B ₂ H ₆	BF ₃	H ₂ Se
Code	0x27	0x28	0x29	0x2A	0x2B	0x2C	0x2D	0x31
Gas Sensor	Malodorous	Indoor Air Quality	Outdoor Air Quality	Non-Methane Total Hydrocarbons	Sulfide	Nitrogen Oxides	Nitric Oxide	Isobutylene
Gas Formula	SMELL	IAQ	AQI	NMHC	SO _x	NO _x	NO	C ₄ H ₈
Code	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Gas Sensor	Propylene Glycol	Methyl Mercaptan	Styrene	Tetrahydrothiophene	Phosphorus Oxychloride	Phosgene	Ethylene Oxide	Trimethylamine
Gas Formula	C ₃ H ₈ O ₂	CH ₄ S	C ₈ H ₈	THT	POCl ₃	COCl ₂	C ₂ H ₄ O	C ₃ H ₉ N
Code	0x3A	0x3B	0x3C	0x3D	0x3E	0x3F	0x40	0x41
Gas Sensor	Dimethylamine	Ethanol	Carbon Disulfide	Ethyl Mercaptan	Dimethyl Disulfide	Ethylene	Methanol	Benzene
Gas Formula	C ₂ H ₇ N	C ₂ H ₆ O	CS ₂	C ₂ H ₆ S	C ₂ H ₆ S ₂	C ₂ H ₄	CH ₃ OH	C ₆ H ₆
Code	0x42	0x43	0x44	0x45	0x46	0x47	0x48	0x49
Gas Sensor	P-xylene	Toluene	Acetic Acid	Carbon Dioxide	Hydrogen Peroxide	Hydrazine	Unsymmetrical Dimethyl Hydrazine	
Gas Formula	C ₈ H ₁₀	C ₇ H ₈	CH ₃ COOH	ClO ₂	H ₂ O ₂	N ₂ H ₄	C ₂ H ₈ N ₂	
Code	0x4A	0x4B	0x4C	0x4D	0x4E	0x4F	0x50	
Gas Sensor	Trichloroethylene	Trichloromethane	Trichloroethane					
Gas Formula	C ₂ HCl ₃	CHCl ₃	C ₂ H ₃ Cl ₃					
Code	0x51	0x52	0x53					

5.1 Read-Out Measured Values

This group of addresses is used to read out measurement values (gas concentrations), temperature, humidity, sensor module range, sensor module gas type, operating light switch control, sensor lifetime and performance.

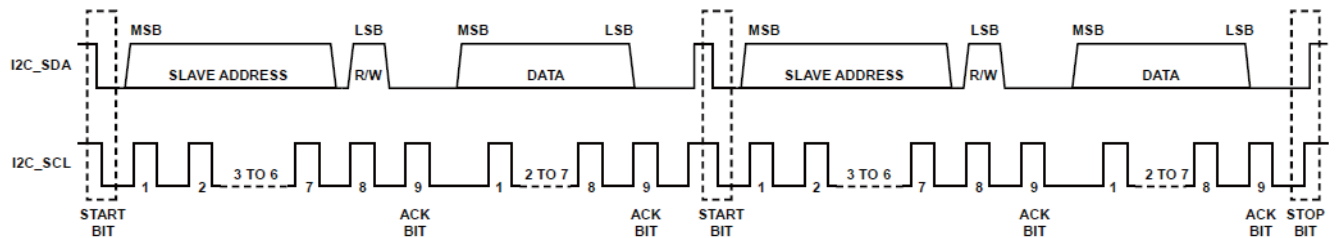
DGM10 Double Gas Module includes two gas sensors, which have their own position on the circuit board S0 and S1. Please see the table below:

Register Address	Data	Readout/Writing	Function	Description
0x00	Byte[0]	Only Read	Sensors Lifetime and Performance	Byte[0]bit[7:4]:S0 Performance Byte[0]bit[3:0]:S1 Performance 2: Sensor failure, replace new sensor 1: Sensor is close to failure, prepare replacement 0 : Working
0x01	Byte[1]	Read & Write	Switch LED	1: On 0: Off
0x02	Byte[2]	Only Read	Temperature	Type: 32 bit float data
0x03	Byte[3]			(data[2]<<24) (data[3]<<16) (data[4]<<8) data[5]
0x04	Byte[4]			Convert according to the 32-bit float data type
0x05	Byte[5]			Unit:°C
0x06	Byte[6]	Only Read	Humidity	Type: 32 bit float data
0x07	Byte[7]			(data[6]<<24) (data[7]<<16) (data[8]<<8) data[9]
0x08	Byte[8]			Convert according to the 32-bit float data type
0x09	Byte[9]			Unit: %RH
0x0A	Byte[10]	Only Read	S0 Gas Sensor measured concentration	Type: 32 bit float data
0x0B	Byte[11]			(data[10]<<24) (data[11]<<16) (data[12]<<8) data[13]
0x0C	Byte[12]			Convert according to the 32-bit float data type
0x0D	Byte[13]			Unit: ppm Oxygen Unit: %vol.
0x0E	Byte[14]	Only Read	S0 Gas sensor range	Unit: uint 32
0x0F	Byte[15]			(data[14]<<24) (data[15]<<16) (data[16]<<8) data[17]
0x10	Byte[16]			Unit: ppm Oxygen Unit: %vol.
0x11	Byte[17]			
0x12	Byte[18]	Only Read	S0 Gas Sensor type	Type: uint 16
0x13	Byte[19]			(byte[18]<<8) byte[19]
0x14	Byte[20]	Only Read	S1 Gas Sensor measured concentration	Type: 32 bit float data
0x15	Byte[21]			(data[20]<<24) (data[21]<<16) (data[22]<<8) data[23]
0x16	Byte[22]			Convert according to the 32-bit float data type
0x17	Byte[23]			Unit: ppm Oxygen Unit: %vol.
0x18	Byte[24]	Only Read	S1 Gas Sensor range	Type: uint 32
0x19	Byte[25]			(data[24]<<24) (data[25]<<16) (data[26]<<8) data[27]
0x1A	Byte[26]			Unit: ppm Oxygen Unit: %vol.
0x1B	Byte[27]			
0x1C	Byte[28]	Only Read	S1 Gas Sensor type	Type: uint 16
0x1D	Byte[29]			(byte[28]<<8) byte[29]

Register Address	Data	Readout/Writing	Function	Description
0x1E	Byte[30]	Only Read	Firmware version number	For the Firmware Version Number, please refer to the read-out data.
0x1F	Byte[31]			
0x20	Byte[32]			
0x21	Byte[33]			
0x22	Byte[34]			
0x23	Byte[35]			
0x24	Byte[36]			
0x25	Byte[37]			
0x26	Byte[38]			
0x27	Byte[39]			
0x28	Byte[40]			
0x29	Byte[41]			
0x2A	Byte[42]			
0x2B	Byte[43]			
0x2C	Byte[44]			
0x2D	Byte[45]			
0x2E	Byte[46]			
0x2F	Byte[47]			
0x30	Byte[48]	Only Read	S0 Sensor serial number	ascii code string Length: 16 bytes The serial number of each sensor is unique
0x31	Byte[49]			
0x32	Byte[50]			
0x33	Byte[51]			
0x34	Byte[52]			
0x35	Byte[53]			
0x36	Byte[54]			
0x37	Byte[55]			
0x38	Byte[56]			
0x39	Byte[57]			
0x3A	Byte[58]			
0x3B	Byte[59]			
0x3C	Byte[60]			
0x3D	Byte[61]			
0x3E	Byte[62]			
0x3F	Byte[63]			
0x40	Byte[64]			
0x41	Byte[65]			
0x42	Byte[66]	Only Read	S1 Sensor serial number	ascii code string Length: 16 bytes The serial number of each sensor is unique
0x43	Byte[67]			
0x44	Byte[68]			
0x45	Byte[69]			
0x46	Byte[70]			
0x47	Byte[71]			
0x48	Byte[72]			
0x49	Byte[73]			
0x4A	Byte[74]			
0x4B	Byte[75]			
0x4C	Byte[76]			
0x4D	Byte[77]			
0x4E	Byte[78]			
0x4F	Byte[79]			
0x50	Byte[80]			
0x51	Byte[81]			
0x52	Byte[82]			
0x53	Byte[83]			
0x54	Byte[84]			
0x55	Byte[85]			

Register Address	Data	Readout/Writing	Function	Description
0x56	Byte[86]	Read & Write	Sleep mode	Entering sleep mode: RX remains high and writes 1 to this register. After entering sleep mode, RX continues to remain high. (After entering sleep mode, the I2C channel becomes invalid until exiting sleep mode) Exiting sleep mode: RX is pulled low for 5ms, then pulled high again
0x57	Byte[87]	Only Read	Reserved	Reserved
0x58	Byte[88]			
0x59	Byte[89]			
0x5A	Byte[90]			
0x5B	Byte[91]			
0x5C	Byte[92]			
0x5D	Byte[93]			
0x5E	Byte[94]			
0x5F	Byte[95]	Only Write	S0 Gas Sensor calibration	Type: 32 bit float data (data[10]<<24) (data[11]<<16) (data[12]<<8) data[13] Convert according to the 32-bit float data type Unit: ppm Oxygen Unit: %vol. Write 4 registers consecutively, and cannot be written together with other registers
0x60	Byte[96]			
0x61	Byte[97]			
0x62	Byte[98]			
0x63	Byte[99]	Only Write	S1 Gas Sensor calibration	Type: 32 bit float data (data[10]<<24) (data[11]<<16) (data[12]<<8) data[13] Convert according to the 32-bit float data type Unit: ppm Oxygen Unit: %vol. Write 4 registers consecutively, and cannot be written together with other registers
0x64	Byte[100]			
0x65	Byte[101]			
0x66	Byte[102]			
0x67	Byte[103]	Only Write	S0 Gas Sensor Restore factory calibration	1: Restore factory calibration Others: invalid Write it alone, not together with other registers
0x68	Byte[104]	Only Write	S1 Gas Sensor Restore factory calibration	1: Restore factory calibration Others: invalid Write it alone, not together with other registers

I²C Transmitted Byte



Read and write interface routines:

```

/*****
Function: Write a byte of data to a register
dev_add: I2C 7bit address is shifted one bit to the left
register_addr: write register address
data: write data
*****/

```

```
void send_data(uint8_t dev_addr, uint8_t register_addr, uint8_t data)
{
    I2C_Start();
    I2C_SendByte(dev_addr);
    if(I2C_CheckAck())
    {
        I2C_Stop();
        return;
    }
    I2C_SendByte(register_addr);
    if(I2C_CheckAck())
    {
        I2C_Stop();
        return;
    }
    I2C_SendByte(data);
    if(I2C_CheckAck())
    {
        I2C_Stop();
        return;
    }
    I2C_Stop();
}
```

/******

Function: register_addr start reading register read_len a byte

dev_addr: I2C 7-bit address is shifted one bit to the left

register_addr : write register address

data: read data storage address

read_len : read length

*****/

```
void read_data(uint8_t dev_addr, uint8_t register_addr, uint8_t* data, uint8_t read_len)
{
    uint8 i = 0;
    I2C_Start();
    I2C_SendByte(dev_addr);
    if(I2C_CheckAck())
    {
        I2C_Stop();
        return;
    }
    I2C_SendByte(register_addr);
    if(I2C_CheckAck())
    {
        I2C_Stop();
        return;
    }
    I2C_ReStart();
    I2C_SendByte(dev_addr|0x01);
    if(I2C_CheckAck())
    {
        I2C_Stop();
        return;
    }
    data[i] = I2C_ReceiveByte();
    i++;
    for(;i<data_len;i++)
    {
        I2C_SendAck();
        data[i] = I2C_ReceiveByte();
    }
    I2C_SendNack();
    I2C_Stop();
}
```



**Business Centre
Europe and the Rest of the World**

EC Sense GmbH
Wangener Weg 3
82069 Hohenschäftlarn, Germany
Tel: +49(0)8178-9999-210 Fax: +49(0)8178-9999-211
Email: office@ecsense.com
www.ecsense.com

**Business Centre
Asia**

Ningbo AQSystems Technology Co., Ltd.
6 Building, Zhong Wu Technology Park No.228,
Jin Gu Bei Road, Yinzhou District NingBo,
Zhejiang Province, P.R. China Post Code: 315100
Tel: +86(0)574 88097236, 88096372
Email: info@aqsystems.cn
www.ecsense.cn