DEGA CZ s.r.o., Malešická 2850/22c 130 00 Praha, Česká republika
DIČ: CZ 279 029 43, IČO: 279 02 943; Telefon (cz) : +420 774 447 660
info@dega.cz, www.dega.cz

Modbus communication for the DEGA UPA III gas controller

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Setting the gas controller into the ModBus RTU mode

The gas controller is set into the Modbus RTU mode with a jumper cable installed on the jumper labeled "JP4" or "RFU # 1" on the "RS485_HOST" channel. The custom address for addressing the Modbus device on the RS485 bus is identical to the address set for the communication protocol Dega.

Modbus RTU specification

Type of node	Slave
Baud rate	9600
Data bits	8
Stop bits	1
Parity	none
Address	Nastavuje se v DegaConfig
Protocol	RTU
Supporting function code	4 – read input register
Broadcast	Ne

What the UPA III responds to

The gas controller is always slave in communication, it only answers to inquiries. The gas controller implements the ModBus RTU instruction 03H, read holding registers from slave station. For inquiry, always follow the required number of registers. The indicated register address counts with the offset 40001 by default, as shown on page http://www.simplymodbus.ca/FC03.htm, which means that for register address 40001, the 0 address is physically transmitted in the Modbus packet.

Since version 21, it is possible to read data from any address in any length. One piece of instruction allows reading of 125 registers at maximum. The value 0EEEEH is to be read from any address, where no register has been implemented.

The following data are contained in individual registers:

40001 Returns the name, firmware, SN in ASCII i.e. „UPAIII,13,15000000001“ , contains 11 registers

40100 Returns the configuration of sensors. Each sensor occupies 10 registers (sensor number 1 occupies the registers 40100 to 40109), sensors 1-32 correspond to digital sensors and sensors with numbers 41 to 48 correspond to analog sensors). The sensors 33 to 40 do not exist and zero data are returned instead.

41000 Returns the temperature of the external temperature detector, provided it is installed in tenths of ° C, 1 register

41002 Returns the status of the gas controller, 1 registr

41010 Returns the current time in the Linux format, two registers (higher, lower word).

41100 Returns the value and status of the sensors connected to the gas controller, included those that have not been configurated, 80 registers in total (2 registers per sensor).

41200 Returns the values of temperature detectorss in all sensors, a total of 96 registers (3 registers per sensor).

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Data format of the register 41100

This instruction is sufficient for reading the detected concentrations, the customer does not need to download the configuration etc.

Data from a total of 40 sensors are being transmitted, each sensor has 4 dedicated bytes. It is upon the user of the protocol interface to take over only the channels he or she needs. The bytes 1 to 4 belong to channel 1, channel 2 uses the bytes 5 to 8, channel 32 the bytes 125 to 128. Analog channels continue in the row, i.e. channel 41 correspond to the bytes 129 to 132, and finally channel 48 disposes of the bytes 157 to 160. These 4 bytes are divided into the first and second pair. The first pair represents the detected concentration of the channel. Detection range is very significant here. If the range of detection is numerically greater than 99 (e.g. Detection of freons, carbon monoxide, ammonia), the value is in tenths of the actual concentration, e.g. 1234 represents the concentration of 123.4 ppm. If the detection range is smaller than 99 (all combustible gases, oxygen, chlorine,...), the value is in hundredths of the actual concentration, e.g. 5678 represents a concentration of 57.78% LEL. The significance of the second pair is the bit map of the sensor status:

ds_state_none = 0, // the sensor is in order, it measures the value below limits
ds_state_alarm1 = 1, // grade 1 alarm (i.e. for explosive gases 5 % LEL)
ds_state_alarm2 = 2, // 10 % LEL (lower explosive limit)
ds_state_alarm3 = 4, // 15 % LEL
ds_state_alarm4 = 8, // 20 % LEL
ds_state_pel1 = 16, // time average PEL exceeded
ds_state_pel2 = 32, // short-time average STEL exceeded
ds_state_calib12 = 64, // more than 12 months have passed since the last calibration
ds_state_overflow=128, // measuring range of the detector exceeded
ds_state_error = 256, // disruption of the sensor (failure in communication with the gas controller or sensor error)

It holds true that several bites at once can be activated.

Data format of the register 41200

Contains data retrieved from the digital sensors (32 sensors). Each sensor occupies 3 registers (sensor 1 from the address 41200, sensor 2 from the address 41203, etc.). The first register contains the status of temperature sensors in the detector. The second register contains the temperature in the gas sensor, which is inserted in the detector, and the third register contains the internal temperature of the processor of the detector.

Data format of the register 41002

Instructions return the bitmap in a higher byte format:

Temp1 = 0x01 // grade 1 temperature alarm exceeded
Temp2 = 0x02, // grade 2 temperature alarm exceeded
TempError = 0x04, // temperature detector error
Deluge = 0x08, // flooding detected
DelugeError = 0x10, // flood detector error
Disabled = 0x20, // the gas controller is in service mode or in output test mode

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HilaAlarm = 0x40 // there was a case of grade 1 alarm at the minimum since the last user time reset