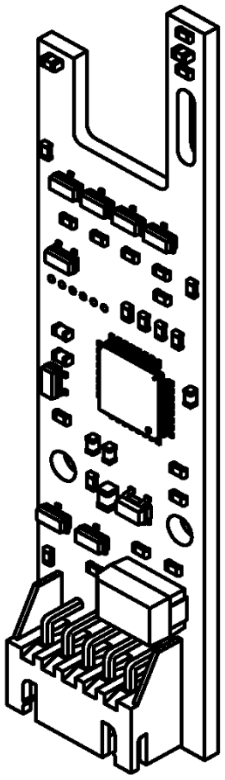
ClimateGuard

CG-Anem-1v1

Modular thermo-anemometer

Technical details



1 Key features

Functional:

- Universal I2C connector
- Air flow velocity measurement
- Outdoor temperature measurement
- Intelligent self-diagnosis system
- Transfer of data in physical quantities
- Precise calibration
- Ability to switch the sensor to a deep-sleep mode
- Compact dimensions
- Large operating temperature range
- Input overvoltage protection

Electrical:

- Supply voltage:
  - Purchased before 01.06.22 - 4.6 V
  - Purchased after 01.06.22 - 3.3 V
- Maximum current consumption based on flow velocity:
  - up to 5.5 m/s – not more 50 mA
  - up to 10.5 m/s – not more 100 mA
  - up to 25 m/s – not more 210 mA

Technical:

- Dimensions
  79 mm x 20 mm x 7 mm
- Weight 12 gr
- Temperature range
  от -20°C до +40°C

2 Description

CG-Anem – universal anemometer of a modular formfactor. The module utilizes NTC thermistors as a sensing elements, which are used in a wide range of industrial devices.

The device supports measuring and calculating the air flow rate using three different heating ranges, depending on the flow rate. The module also measures the air temperature.

Temperature measurement, calculation algorithms and data transfer via I2C with a bus frequency of up to 200 kHz are implemented on the Atmega8 microcontroller installed on the board. In order to increase energy efficiency, the module can be switched to deep-sleep mode. Provided ability to receive device current state via I2C, which allows to determine the malfunction during the module operation.

Table of Contents

3 Device Characteristics

3.1 Technical

Parameter	Value			Units
	Not less than	Operational	Less than	
Supply voltage	4,5 (3.2)	4.6 (3.3)	4.7 (3.4)	V
Maximum current consumption	-	50	210	mA
Temperature operating range	-20	+20	+40	°C
Moisture operating range	0	60	98	%
Sensor warm-up time	10	-	15	sec

Table 1 (technical characteristics)

3.2 Metrological

The calculation of the flow rate is performed by converting the temperature difference between the hot and cold probes of the thermo-anemometer. The Steinhart-Hart equation is used to calculate the ambient temperature:

$$\frac{1}{T} = A + B * \ln(R) + C * \ln(R)^3$$

where T – temperature, K,

R – thermo-anemometer resistance,

A,B,C – Hart's coefficients.

Parameter	Value			Units
	Not less than	Operational	Less than	
Measurable air flow velocity range	0.1	-	25	m/s
Measured temperature range	-20	-	+100	°C
Maximum error in measuring air flow velocity	-	-	0.3 ± 10%	m/s
Maximum temperature measurement error	-	-	±1	°C
Air flow velocity resolution	-	0.1	-	m/s
Temperature resolution	-	0.1	-	°C

Table 2 (metrological characteristics)

4 Data interaction

4.1 Register map

Data exchange (setup and transmission of measured values) is carried out via the I2C interface at a frequency of up to 200 kHz. The sensor works in the Slave mode with the default address 0x11 (software level configuration).

Register Name	Address	Size (bits)	Name	R/W	Units
FACTORY	0x00-0x03	24	<reserved>	R	-
VERSION	0x04	8	Firmware version	R	-
WHO_I_AM	0x05	8	Device ID	R	-
STATUS	0x06	8	Device Status	R/W	-
WIND	0x07-0x08	16	Airflow velocity	R	0,1*m/s
ADC_COLD	0x09-0x0A	16	Cold probe data	R	-
ADC_HOT	0x0B-0x0C	16	Hot probe data	R	-
SUPPLY_V	0x0D	8	Input voltage level	R	0,1*V
PWR_WT	0x0E	8	Heating power	-	0,1*W
TEMP_COLD	0x10-0x11	16	Cold probe temperature	R	0,1*°C
TEMP_HOT	0x12-0x13	16	Hot probe temperature	R	0,1*°C
dT	0x14-0x15	16	Temperature difference between hot and cold probes	R	0,1*°C
WIND_MAX	0x21-0x22	16	Absolute maximum of airflow velocity	R	0,1*m/s
WIND_MIN	0x23-0x24	16	Absolute minimum of airflow velocity	R	0,1*m/s
RESET_WIND	0x25	8	Resets absolute minimum and maximum	W	-

Table 3 (data interaction register map)

4.2 Description of registers

4.2.1 Device ID

[address: 0x04, size: 8 bit, access: R]

The register for storing the current firmware version. Used to control and timely update software.

4.2.2 Firmware version

[address: 0x05, size: 8 bit, access: R]

Stores the module identifier. By default, the identifier is the device address

4.2.3 Status register

[address: 0x06, size: 8 bit, access: R/W]

Contains information about the module operation.

Bits	7	6	5	4	3	2	1	0	
	STITR	**STIT**	**STWDT**	**-**	**-**	**-**	**STOV**	**STUP**	**STATUS**
Read/write	R	R	W/R	-	-	-	R	R	
Initial value	0	0	0	0	0	0	0	0	

— **Bit 7 – STITR (STATUS INCORRECT TARING RANGE)**
If set to 1 - error of the calibration volume: the number of temperature and flow rate samples not equal to each other (any range)

— **Bit 6 – STIT (STATUS INCORRECT TARING)**
If set to 1 - incorrect calibration: the sequence of flow rate sampling must be strictly increasing, the sequence of temperature sampling must be strictly decreasing

— **Bit 5 – STWDT (STATUS WATCHDOG TIMER)**
If set to 1 - the watchdog timer is enabled, otherwise is disabled. The value of this bit is stored in the EEPROM

— **Bits 4..2 Res: Reserved**

— **Bit 1 – STOV (STATUS OVERVOLTAGE)**
If set to 1 - input voltage overshoot: The input voltage exceeds the maximum allowable voltage of the anemometer. Under this condition, the heater should not be turned on

— **Bit 0 – STUP (STATUS UNSTEADY PROCESS)**
If 1 is set - transient process: dT (temperature difference between hot and cold probes) between adjacent measurements changes by more than the allowable value (0.2 ºC)

4.2.4 Cold probe temperature from ADC
[address: 0x09, size: 16 bit, access: R]

Measured data from a cold probe, directly from an ADC, without processing

4.2.5 Hot probe temperature from ADC
[address: 0x0V, size: 16 bit, access: R]

Measured data from a hot probe, directly from an ADC, without processing

4.2.6 Air flow velocity
[address: 0x07, size: 16 bit, access: R]

Contains the measured and converted air velocity, m/s. Refresh rate – 1 s

4.2.7 Input voltage level
[address: 0x0D, size: 8 bit, access: R]

This register is used to control the level of the supplying voltage

4.2.8 Heating power
[address: 0x0E, size: 8 bit, access: R]

The register contains the current heating power, W, which is supplied to the hot probe of the thermo-anemometer

4.2.9 Cold probe temperature
[address: 0x10, size: 16 bit, access: R]

Contains the measured ambient temperature, ºC

4.2.10 Hot probe temperature
[address: 0x12, size: 16 bit, access: R]

Contains the measured heated wire temperature, ºC

4.2.11 Cold and hot probes temperature difference
[address: 0x14, size: 16 bit, access: R]

Contains the measured temperature difference between the heated and the cold probes, ºC

4.2.12 Absolute maximum of airflow velocity
[address: 0x21, size: 16 bit, access: R]

Contains the absolute maximum air flow velocity from the moment the anemometer is turned on.

4.2.13 Absolute minimum of airflow velocity
[address: 0x23, size: 16 bit, access: R]

Contains the absolute minimum air flow velocity from the moment the anemometer is turned on.

4.2.14 Reset of absolute minimum and maximum
[address: 0x25, size: 8 bit, access: W]

Resets the readings of absolute maximum and minimum by inputting a number other than zero.

5 Connection socket

The pinout of the connector is shown in the table below

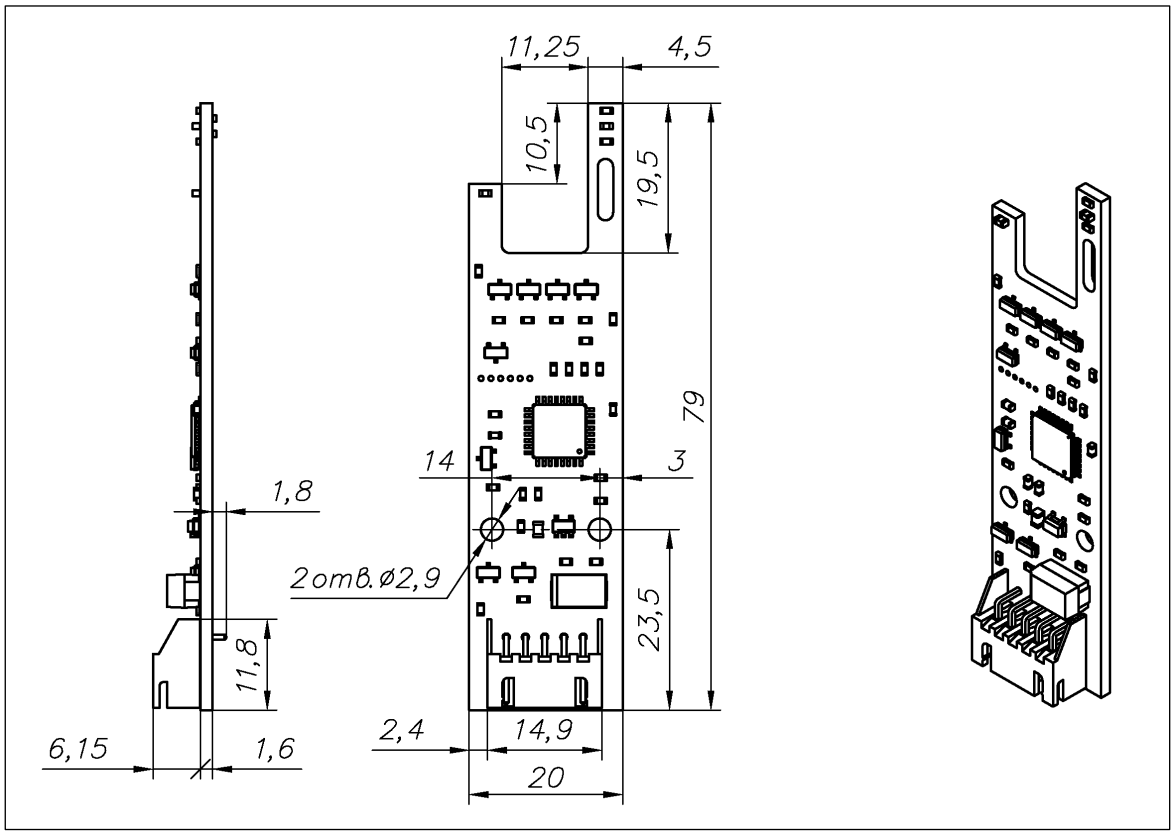
Contact	Name	Description
1	VCC	Sensor supply circuit
2	GND	Ground (common wire)
3	I2C-SCL	I2C serial clock line
4	I2C-SDA	I2C serial data line
5	SLEEP	Sleep mode line

Table 4 (pinout of the connector)

6 Sleep mode

To switch the module to the sleep mode, it is necessary to apply a high level to the SLEEP pin (5 pins). To wake the module up, set a low level on the line i.e. drop the line to 0 or leave SLEEP unconnected. For standard operation of the module - the output can be left unconnected.

7 Device drawing



8 Reference

Contact and additional information are presented in the table below

Description	Link
Manufacturer website	http://climateguard.ru/
Module library	https://github.com/climateguard/CG-Anem
Telegram community	https://t.me/climateguard_community

Table 5 (Reference)

9 Additional terms

The board can be coated with a moisture-repellent varnish at the manufacturing stage (upon additional request) to ensure moisture protection of the module.