Specification

Fresh Anemomeeter FRAM-KO100

Introduction

This document describes the properties and usage conditions of a Fresh Anemometer (FAM). FAM is a device measuring the movement of air through fresh air inlet collector.

Contents

Version History

Kuupäev	Ver.	Kirjeldus	Nimi
2019-11-20	1.0	Draft, sent to preliminary review.	Peeter Vois
2020-01-24	1.1	Air flow value, power consumption, colour codes of wires.	Peeter Vois
2020-03-31	1.2	English version, made public	Peeter Vois

Properties

Measurement Conditions

The precision of 15% of the reading is ensured in the following cases:

Air pressure: 900 ... 1100 hPa.

Temperature: -25 ... 50 °C.

Air flow: 5... 15 L/s from outside to indoors.

The anemometer's reading can be taken in approximately the following conditions:

Air pressure: 900 ... 1100 hPa

Temperature: -40 .... 60 °C

Air flow: 2 ... 40 L/s from outside to indoors or -2 ... -40 L/s from indoors to outside.

Communications

Communications protocol: ModBus RTU (19200, 8E1)

Maximum time to the start of sending a reply telegram: 10ms.

Blind time after the end of a telegram: 10ms. (A Master telegram starting within that time becomes lost.)

Other Indicatiors

Input voltage: 8 ... 24V

Power consumption: 5...6 mA @ 24V;   10...14 mA @ 8V

Air resistance: 2.6±0.4 L s-1 Pa-0.5 @ 5...15 L/s (determined while using the inlet collector)
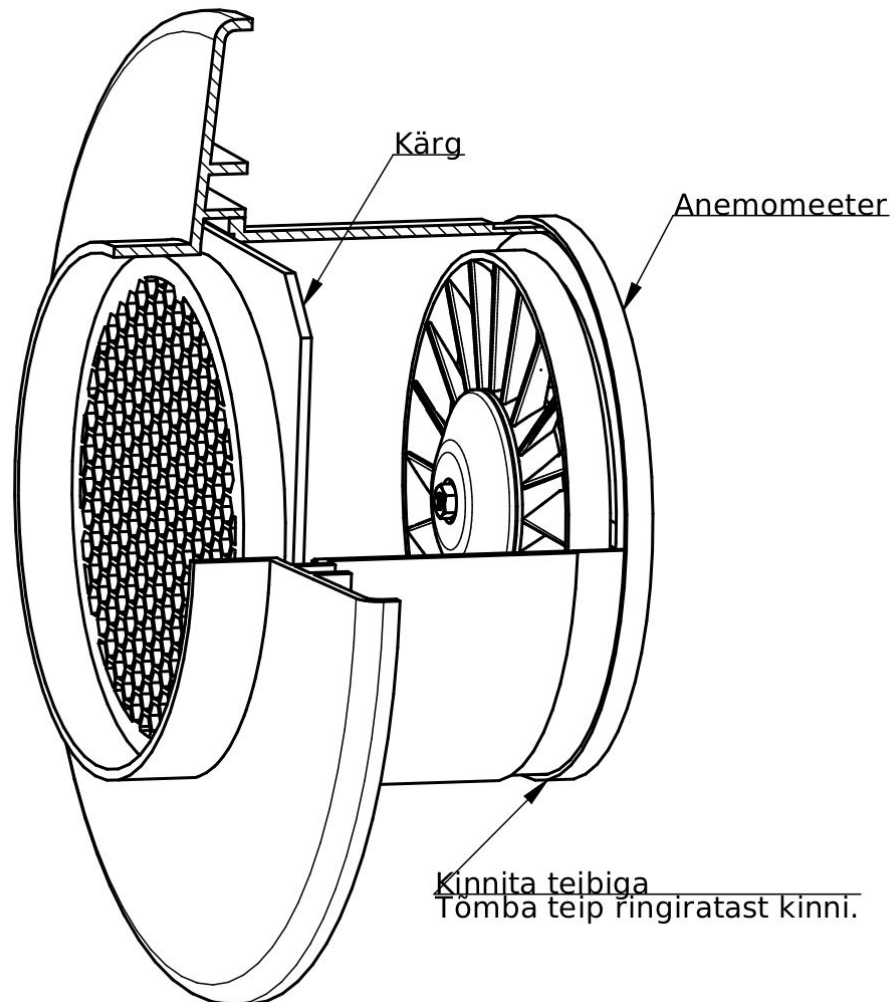
Data Outputs

- The latest reading in units [m3/h] and [L/s]

- The average reading of the latest minute in [L/s]

- The average reading of the latest 24 hours per each hour [L/s]. All these indicators are updated after every minute.
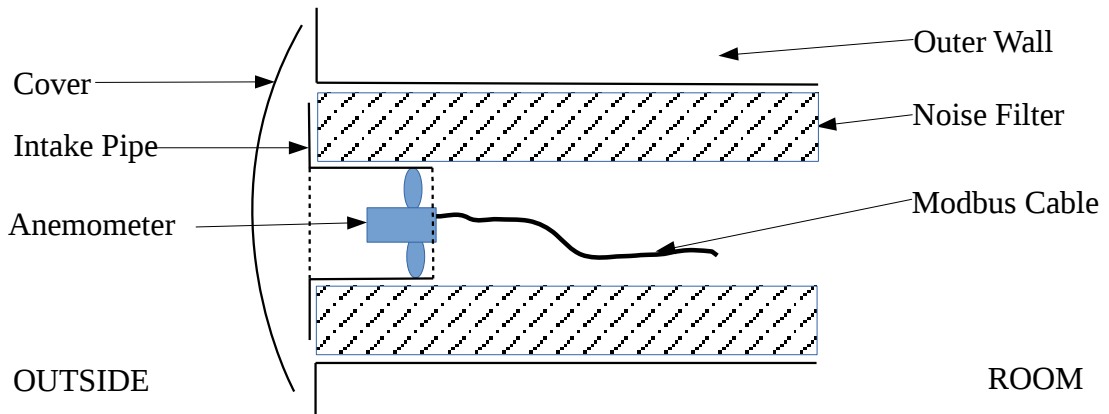
Installation

Mechanical

The anemometer is developed to be installed to a special inlet collector, using an electrician's tape:


When placing the anemometer into an air duct, make sure that the fan rotates freely. Make sure that the cable will not move against the fan during or after the installation works. Anemometer's position in a ventilation duct:

Tauria

Electrical

The anemometer must be connected to the automation network, following ModBus guidelines. The plug's connection diagram is as follows:
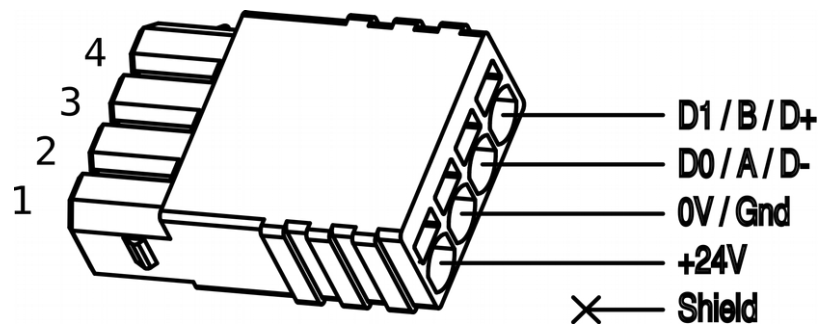
Plug type: PTSM 0,5/ 4-P-2,5

The RS485 channel must be under preliminary voltage when idling. Preliminary voltage between D1 and D0 signal must be above 0.3V. The anemometer uses the preliminary voltage level to set the connection of the signals D1 and D0 to the plug and determines automatically the signal connections. The figure shows the preliminary voltage diagram where the cable's wave resistance is 120 Ohms.
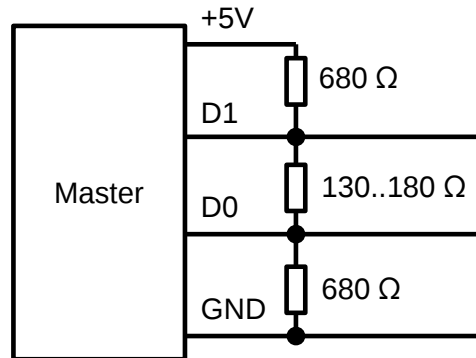
Cabling

The colour codes of cabling depend on the cable used. The following table provides a summary of the cable colour codes used.

Kontakt Nr.	Signaal	Kaabli variant	
		CAT-5	PP001165 (Modbus)
4	D1 / B / D+	White/Orange	White/Orange
3	D0 / A / D-	Orange	Orange/White
2	0V / GND	Blue	Blue/White
1	+24V / POWER	Brown	White/Blue

Operations

Value Readings

After every second, the indicator's reading increases by one. This also means that there will be a new result in the result registers. If the fan stands still or moves slower than the device's minimum setting for registering the fan's movement, the reading would be 0 and the indicating counter would not increase.

If the indicator reads 32767 or -32767 then the air moves faster than the anemometer is capable of calculating. The value -32768 means "not a number".

History of Readings

There is a register for an hour's average indictor for each of the past 24 hours. All those registers are updated every minute. Reading all those registers (5 ... 28) with a single command ensures that the readings do not change in the middle of reading them. If reading those registers one by one, it is

possible that the readings in the second part are those of a newer moment in time.

Starting up

If the anemometer is started by switching on its power supply, its updater will run for 2 seconds. During that time, the anemometer's light will blink 3x per second. The airflow is not measured during that time.

Visual Inspection of an Active Connection

If the Modbus network's master device sends a message to the anemometer, the anemometer's light will blink on for a moment and will then remain off for the rest of the second. During intensive data exchange, the light will blink 1x per second.

Registers

ModBus registers are of standardised type U16 (16-bit unsigned integer). The sequence of ModBus bytes is structured for other data types, joining several registers together. For example, U32 consists of two registers (Count = 2 in the table), whereas all the bytes are in BE sequence across all registers. All combined registers must be written or read with a single telegram, otherwise the device will return an error message.

Type C## means the structure. All the structure's registers must be read or written with a single telegram, otherwise the device will return an error message. Inside the structure, each row describes one (combined) register, all the bytes of which are in the BE sequence. The sequence of bytes does not span the structure but instead spans the structure's members, separately per each member.

Input Registers

Input registers are read-only registers and do not retain their value after a power outage.

Commands: 0x04				
Reg #	Count	Type	Access	Description
0	1	U16	R-	Running sample counter.
1	1	U16	R-	Internal frequency. (0 - 60000 [a.u.])
2	1	S16	R-	Last 1 seconds average airflow x100. (-300.00 - 300.00 [m3/h])
3	1	S16	R-	Last 1 seconds average airflow x100. (-300.00 - 300.00 [L/s])
4	1	S16	R-	Last 1 minute average airflow x100. (-300.00 - 300.00 [L/s])
5	1	S16	R-	Last 1 hour average airflow x100. (-300.00 - 300.00 [L/s])
6 .. 28	1	S16	R-	Average airflow 2 .. 24 hours back x100. (-300.00 - 300.00 [L/s])
29	1	S16	R-	MCU temperature (-40 .. 100 [oC])

Holding Registers

Holding registers are stored in permanent memory and retain their value after a power outage.

Commands: 0x03, 0x06, 0x10, 0x17				
Reg #	Count	Type	Access	Description
00 (x0000)	1	U16	R-	=0x0210; Registers structure version number.
01 (x0001)	1	U16	RW	Baud rate and Parity of bus. Default 19200, even parity
02 (x0002)	1	U08	R-	=255; Bus address. (0…255)

Virtual Registers

Virtual registers act like holding registers but they may not retain their value after a power outage. The value of virtual registers may not be retained during the device's operation, either.

Commands: 0x03, 0x06, 0x10, 0x17				
Reg #	Count	Type	Access	Description
30000 (x7530)	5	C01	-W B	Set device address.
30005 (x7535)	4	U64	R-	Read Serial code.
30009 (x7539)	4	U64	-W B	Start bootloader.
30013 (x753D)	1	U16	-W	Calibration key.
30014 (x753E)	2	C02	RW	Set baud rate and parity.

Structure: C01 "Set device address"			
Reg #	Count	Type	Description
0	4	U64	Serial code.
4	1	U08	Device bus address (0 .. 255).

Structure: C02 "Set baud rate and parity"			
Reg #	Count	Type	Description
0	1	U16	=192; Baud rate *0.01.
1	1	U16	=1; Parity: 0-No; 1-Even; 2-Odd

Labelling and Packaging

Project Labelling

If anemometers are ordered for a specific project then the anemometer's address is pre-set in production. The anemometer's label shows its:
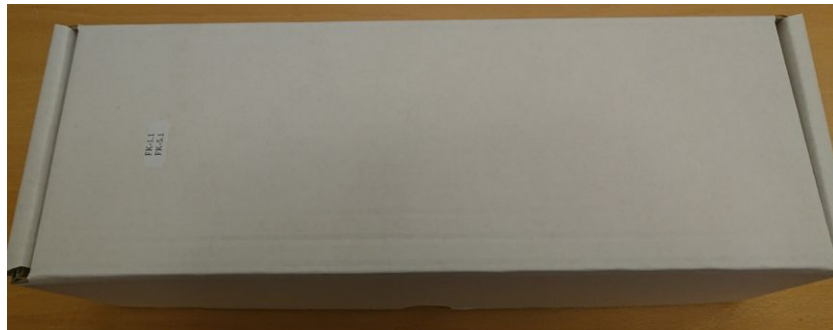
- serial number;

- Modbus address.

- name in the project diagram.

Example:

Wholesale Box

9 anemometers fit into a wholesale box. The box bears its first and last anemometer's labels.

Inside the box, each anemometer's label is put on the lid near it: