UNIVERSAL FLIGHT CONTROLLER

TECHNICAL PRODUCT PASSPORT

Registration No.: **N/A**

Effective from «___» _____ 2025

Заводський №: **SFC-25F02B-CHN-00846**

Factory No.: **SFC-1**

When transferring the product to another owner, this passport must accompany the product.

2025

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REVISION HISTORY

Revision	Date	Description of Changes
rev. A	01.01.2024	Initial version
rev. B	01.01.2025	Typo corrections in Section **X**

PURPOSE AND SCOPE OF APPLICATION

The universal flight controller (hereinafter referred to as the "flight controller") is intended for controlling aerial, ground, and surface unmanned vehicles.

It provides reliable control and navigation of unmanned platforms under demanding operating conditions.

DELIVERY SET

The flight controller is delivered in the configuration specified in Table 1:

Table 1 – Delivery Set

№	Item	Qantity
1	Flight controller	1
2	Connectors with pre-attached wires	12
3	Packaging box	1
4	Aluminum enclosure	1*

* - The enclosure is included only in the extended configuration and is not supplied with the basic flight controller kit.

TECHNICAL SPECIFICATIONS

The main components of the flight controller are listed in Table 2:

Table 2 – Core Components of the Flight Controller

№	Type	Model	Note
1	Processor	STM32H743	
2	IMU №1	ADIS16470	
3	IMU №2	ICM45686	
4	IMU №3	BMI088	
5	Magnetometer	MMC5983MA	
6	Static air pressure sensor	MS5611	
7	Differential air pressure sensor	5525DSO-B001DS	
8	Temperature sensor №1	TMP117	
9	Temperature sensor №2	TMP390	Autonomous
10	Memory (FRAM)	MB85RS256	
12	External watchdog timer / power voltage monitor	CAT823	Autonomous

The main interfaces of the flight controller are listed in Table 3:

Table 3 – Main Interfaces of the Flight Controller

№	Type	Parameters	Note
1	1x Ethernet	10/100 Mbit/s	With Passive PoE support (8–50 V)
2	2x CAN FD	1 Mbit/s, 5 V	Galvanically isolated (5000 V)
3	2x RS-485	16 Mbit/s, 5	Galvanically isolated (3500 V)
4	1x SBUS/PPM/DSM	0…3.3V	ESD protection + buffer
5	1x RSSI	0…3.3V	ESD protection
6	14x PWM	0…3.3V	ESD protection + buffer
7	1x I2C	400kHz, 0… 3.3V	ESD protection + re-driver
8	1x USB Type-C	USB FS 12 Mbit/s	For setup, firmware flashing, or debug power supply
9	1x ARM JTAG	—	Standard full-size ARM JTAG
10	1x Micro SD	—	ESD protection + power switch

Controller Interface Connections (Tables 4 – 13):

Table 4 – Ethernet/PoE interface Connection

Ethertnet/PoE			
№	**Name**	**Type**	**Note**
1	RX+	Input	
2	RX-	Input	
3	TX+	Output	
4	TX-	Output	
5	VIN+	Power	8–50V
6	VIN+	Power	8–50V
7	GND	Power	
8	GND	Power	

Table 5 – SBUS/PPM/DSM/RSSI Interfaces Connection

SBUS/PPM/DSM (RC IN/ RSSI PWM)			
№	**Name**	**Type**	**Note**
1	+5V OUT	Power	
2	RSSI IN	Input	
3	SBUS/DSMX	Input	
4	PPM IN	Input	
5	GND	Power	

Table 6 – I2C Interface Connection

I2C			
№	**Name**	**Type**	**Note**
1	+5V OUT	Power	
2	I2C1 SCL	In/Out	
3	I2C1 SDA	In/Out	
4	GND	Ground (Input)	

Table 7 – CAN Interface (№1 and №2)

CAN №1, CAN №2			
№	**Name**	**Type**	**Note**
1	VIN	Power	Optional external power (8–50 V)
2	CAN1 H	In/Out	
3	CAN1 L	In/Out	
4	GND	Input	

Table 8 – RS-485 Interface (№1 and №2)

RS-485 №1, RS-485 №2 (galvanically unleashed)			
№	**Name**	**Type**	**Note**
1	VIN	Power	Optional external power (8–50 V)
2	RS-485 V	In/Out	
3	RS-485 A	In/Out	
4	GND	Input	

Table 9 – USART Interface (№1, №2, №3)

SBUS/PPM/DSM (RC IN/ RSSI PWM)			
№	**Name**	**Type**	**Note**
1	+5V OUT	Power	
2	USART TX	In/Out	
3	USART RX	In/Out	
4	USART CTS	In/Out	
5	USART RTS	In/Out	
6	GND	Power	

Table 10 – Main Power Input

PWR IN			
№	**Name**	**Type**	**Note**
1	VIN	Power	External power input (8–50 V)
2	VIN	Power	External power input (8–50 V)
3	GND	Power	
4	GND	Power	

Table 11 – PWM/GPIO Interface

PWM/GPIO			
№	**Name**	**Type**	**Note**
1	PWM1	In/Out	
2	PWM2	In/Out	
3	PWM3	In/Out	
4	PWM4	In/Out	
5	PWM5	In/Out	
6	PWM6	In/Out	
7	PWM7	In/Out	
8	PWM8	In/Out	
9	PWM9	In/Out	
10	PWM10	In/Out	
11	PWM11	In/Out	
12	PWM12	In/Out	
13	PWM13	In/Out	
14	PWM14	In/Out	
15	GND	Power	

Table 12 – ARM JTAG Interface (20 pin)

ARM JTAG (20 pin)			
№	**Name**	**Type**	**Note**
1	VTref	Power	
2	NC	—	Not used
3	nTRST	In/Out	
4	GND	Power	
5	TDI	In/Out	
6	GND	Power	
7	TMS	In/Out	
8	GND	Power	
9	TCK	In/Out	
10	GND	Power	
11	RTCK	In/Out	
12	GND	Power	
13	TDO	In/Out	
14	GND	Power	
15	nRESET	In/Out	
16	GND	Power	
17	DBGRQ	In/Out	
18	GND	Power	
19	+5V IN	Power	
20	GND	Power	

Main technical specification of Flight controller is displayed in Table 13:

Table 13 – Technical Specifications

№	Characteristic	Unit	Measurement Conditions	Value
1	Supply voltage (including PoE input)	V		8–50
2	Current consumption	A	V = 12 M	0.1±0.05
3	Power consumption	W		1.5
4	Gyroscope zero bias drift	°/год	T = 25 °C	8.0
5	Gyroscope angle random walk	°/√h		0.3
6	Gyroscope bandwidth	Hz		550.0
7	Accelerometer offset instability	μg		13.0
8	Accelerometer measurement range	g		±40
9	Relative error of differential airspeed sensor	%		±0.25
10	Absolute error of static air pressure sensor	mBar		±2.5
11	Absolute resolution of static air pressure sensor	mBar(m)		0.012 (~0.1)
12	Absolute temperature measurement error	°C		±0.1
13	Moisture protection	IP		IP64 or better
14	Operating temperature range	°C		-55… +85
15	Main board dimensions	mm		170*85
16	Main board weight	g		84
17	Mean total lifespan	h		TBD

DEVICE AND PRINCIPLE OF OPERATION

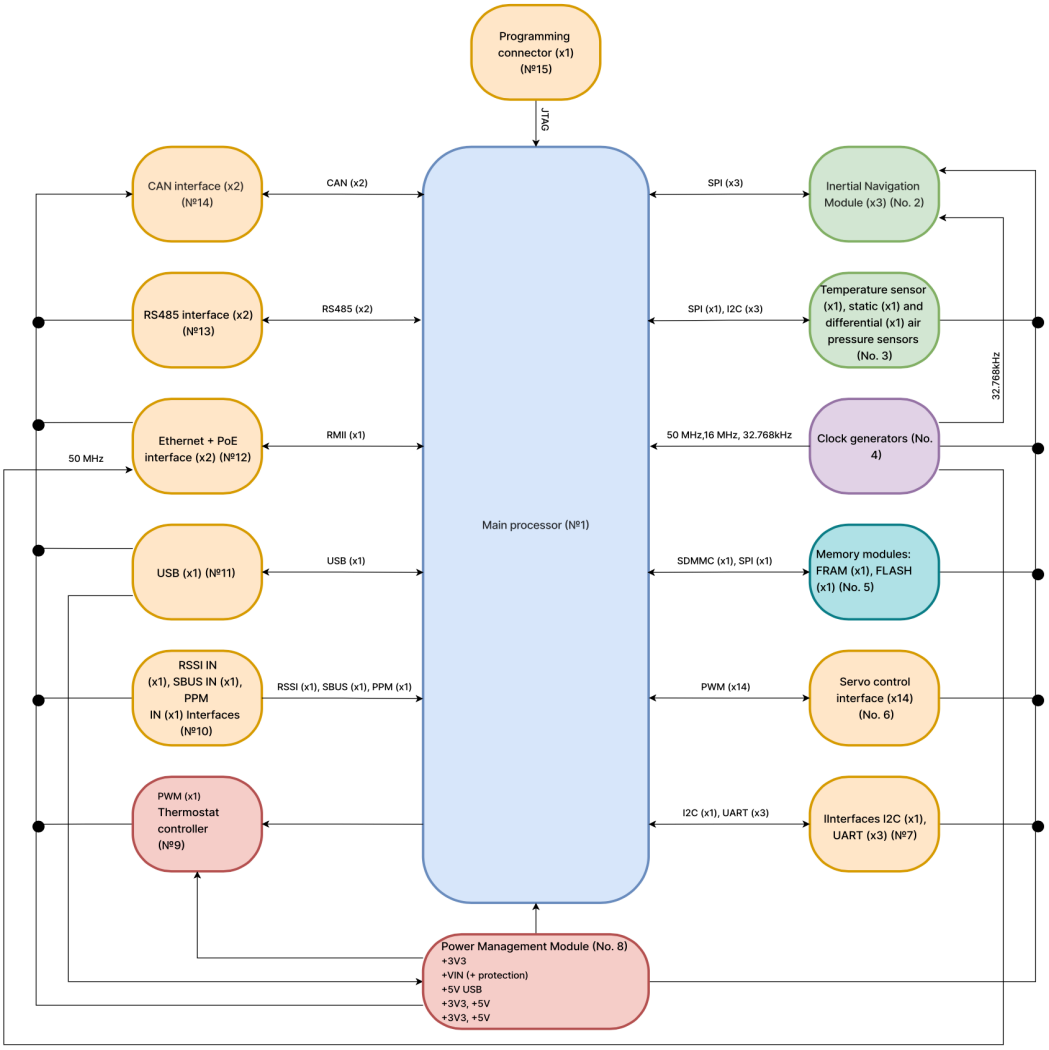

Figure 1. Block Diagram of the Flight Controller

The flight controller (see Fig. 1) consists of the following modules:

Main Processor

The central processing unit controlling all autopilot systems, including sensor data processing, mission execution, and coordination between modules.

Inertial Navigation Module

A highly reliable triple-triple redundant module ensuring precise angular orientation and acceleration, even in case of failure of one or more components.

Static and Dynamic Pressure Sensors, Thermometer: Sensors for measuring static and dynamic air pressure, used for airspeed calculation altitude, and ambient temperature — essential for accurate flight dynamics.

High-Precision Clock Generators: Internal highly stable clock sources (±2.5/5 ppm) ensuring synchronization of the processor, navigation module, and interface drivers.

FLASH and FRAM Memory Modules: Non-volatile memory devices for storing critical data like system parameters, configurations, tasks, and log files.

Servo Control Interface: Supports up to 14 external actuators with EMI and ESD protection, ensuring high-reliability control; also usable as general-purpose I/O (GPIO).

I2C and UART Interfaces: Universal protected interfaces with EMI/ESD shielding and re-drivers for signal integrity.

Power Management Module: Wide input voltage range (8–50 V) with EMI/ESD filtering, powering all internal subsystems and generating required voltage levels.

Thermostat Controller: Stabilizes inertial sensor temperatures, includes autonomous preheating for low-temp operation down to -55 °C.

RSSI IN, SBUS IN, PPM IN Inputs: Interfaces for connecting RC receivers and monitoring radio signal strength (RSSI).

USB Type-C Port: Universal port for debug powering, firmware flashing (DFU), and connection to onboard computer or configuration software.

Ethernet 10/100 Base Port: Network interface with Passive PoE support (up to 50 V) for integration with ground stations or networked devices.

RS485 Ports: Two isolated EMI/ESD-protected ports, future support for MODBUS-capable devices.

CAN Ports: Two isolated ports with EMI/ESD protection, supporting DroneCAN for integration with modern onboard and peripheral systems.

OPERATING INSTRUCTIONS

The flight controller must be operated according to the requirements and conditions specified in this technical passport. Exceeding operational limits is not permitted.

STORAGE AND TRANSPORTATION

The controller must be stored in an individual box and antistatic bag, in a dry, heated, and clean environment with a temperature from +5 to +40 °C and relative humidity not exceeding 80%.

CERTIFICATE OF ACCEPTANCE

The primary controlled parameters are listed in Table 14:

Table 14 – Controlled Parameters

№	Characteristic	Unit	Measurement Conditions	Acceptable Range	Inspection Result
1	Supply voltage, V	V	8V, 12V, 50BV	8..50	+
2	Standby current, I	A	V = 12 V	0.05-0.2	+
3	Absolute heater current			TBD	
4	Relative data loss overUSART	%	Test packet size - 512 bits, transfer rate - 115200 baud, 3 retries	Not allowed	-
5	Relative data loss over RS-485				+
6	Relative data loss over CAN				+
7	Relative data loss over PPM				+
8	Relative data loss over SBUS				-

Table 14 – Continued

9	Relative value of data loss when receiving via I2C port	%	Test packet size - 512 bits, transfer rate - 115200 baud, 3 retries.	Not allowed	-
10	Permissible relative error of RSSI level measurement			< 3	-
11	Absolute latency (ping) over Ethernet	ms		< 50	+
12	Relative packet loss over Ethernet	%	100 packets of 64-bit length, sent over a local test network.	< 1	+
13	Permissible relative error in servo control signal frequency, f		V = 12 V, f = 50 HZ	< 10	+
14	Permissible relative error in servo signal duty cycle, T		V = 12 V, T = 1..2 ms.	< 1	+
15	Number of non-operational sensors	pcs	All permissible operating conditions	Not allowed	-

Based on quality control results, the flight controller is deemed fit for operation.