AVIATION ARTUR TRENDAK

FLIGHT MANUAL

GYROCOPTER

TERCEL Carbon

SERIAL NUMBER:

REGISTRATION MARKS:

NUMBER ON FILE:

THE MANUAL WAS APPROVED WITH A DECISION OF PRESIDENT OF THE CIVIL AVIATION AUTHORITY

DATED …… NO. ……

"ULTRALIGHT" CATEGORY

THIS GYROCOPTER CAN BE USED IN THE "ULTRALIGHT" CATEGORY FOR LEISURE, SPORTS AND DEMONSTRATION PURPOSES AS WELL AS OTHERS, EXCLUDING AIR TRANSPORT.

USING THIS GYROCOPTER FOR TRAINING AND PRACTICE TO OBTAIN A CERTIFICATE OF QUALIFICATIONS OF AN ULTRALIGHT GYROCOPTER PILOT AS WELL AS HAVE QUALIFICATIONS ENTERED IN THIS CERTIFICATE CAN BE DONE SOLELY IN A CERTIFIED TRAINING CENTRE.

THE GYROCOPTER MUST BE USED ACCORDING TO THE RESTRICTIONS AND INFORMATION STATED IN THIS INSTRUCTION MANUAL.

THIS MANUAL MUST ALWAYS BE AVAILABLE ON BOARD THE GYROCOPTER.

The manual has been developed as per the requirements of the regulations in Annex No. 5 “Ultralight Aircraft” - of the Decree of the Minister of Infrastructure dated 25 April 2005 on Excluding the Application of Some of the Laws of the Act on Air Law for Some Sorts of Aircraft as well as Defining the Conditions and Requirements concerning the Use of this Aircraft (Official Journal 107 section 904) with subsequent amendments.

It is not allowed to make any entries and supplements in this “Flight Manual” without the consent of the Civil Aviation Authority.

In case this Manual is lost, you should notify the Civil Aviation Authority instantaneously, and when outside the border of your country - an equivalent institution.

Any person to find this manual is requested to send it in instantaneously to Urząd Lotnictwa Cywilnego (Civil Aviation Authority), 02-247 Warszawa, ul. Marcina Flisa 2, Poland, and when outside the border of your country to an equivalent institution.

Chapter 0 Organizational Information

0.1 Register of Changes

Any changes of this manual, except for the up-to-date weighing data, must be recorded in the table below as well as be approved by the Civil Aviation Authority (CAA).

A new or revised text in changed pages must be marked with a black vertical line on the margin and a change number. The number of the last change in a given page and its date must be placed in the page footer. Every time a change is entered, the pages listed in the table below must be mentioned.

Change no.	Description of change	Pages affected	Entry date	Signature

Change no.	Description of change	Pages affected	Entry date	Signature

0.2 List of Up-to-date Pages

Chapter	Page	Date	Chapter	Page	Date
	Title	26.10.2020	5	5-1	26.10.2020
	Reverse	26.10.2020		5-2	26.10.2020
0	0-1	26.10.2020		5-3	26.10.2020
	0-2	26.10.2020		5-4	26.10.2020
	0-3	26.10.2020		5-5	26.10.2020
	0-4	26.10.2020		5-6	26.10.2020
1	1-1	26.10.2020	6	6-1	26.10.2020
	1-2	26.10.2020		6-2	26.10.2020
	1-3	26.10.2020		6-3	26.10.2020
	1-4	26.10.2020		6-4	26.10.2020
2	2-1	26.10.2020		6-5	26.10.2020
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3	3-1	26.10.2020	9	9-1	26.10.2020
	3-2	26.10.2020		9-2	26.10.2020
	3-3	26.10.2020			
	3-4	26.10.2020			
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0.3 Table of Contents

Chapter 1 General Information

1.1 Introduction

This manual has been written to provide pilots and engineers with information essential for safe and effective operation on **TERCEL Carbon** gyrocopter. The manual also contains basic guidelines from the gyrocopter manufacturer and also legal requirements concerning the performance of flights.

The manual is not a substitute for theoretical and practical training in respect of piloting gyrocopters.

TERCEL Carbon gyrocopter pilots must hold a qualification certificate or a valid licence for ultralight aircrafts with specialization for gyrocopters. Before flight pilots must become acquainted with the uniqueness of the gyrocopter. We recommend you read both the Flight Manual and the Service Manual to be fully familiar with the structure, all the equipment and the driving unit of the gyrocopter.

The gyrocopter can only be used for flight when it is technically operative and holds a valid authorization to perform flights. An authorization to perform flights is entered into the ultralight aircraft book, which is a document identifying an ultralight aircraft and its units as well as containing details about the history of usage.

The utilized gyrocopter should be entered into aircraft records kept by the Civil Aviation Authority as well as hold current air third-party insurance.

1.2 Basis for Airworthiness Acknowledgment

The legal basis for operating a gyroplane is provided by national law and its respective regulations. The instructions and conditions contained have to be considered when operating the gyroplane. All documented performance data and operating procedures have been identified within the certification processes for this gyroplane by means of flight test and analysis.

TERCEL Carbon gyrocopter meet British Civil Airworthiness Requirements CAP 643 Section T Issue 4. They comprise requirements and constitute the basis for the issue of Certificates, Permits and Approvals in accordance with the Air Navigation Order.

1.3 Description of the Gyrocopter

TERCEL Carbon is a two-seat ultralight gyrocopter. The main structural component is the fuselage which is constructed with composite-carbon material. Two carbon tail booms are attached from the lower part of the fuselage to a twin vertical tail unit. This consist of twin stabilizers and rudders on which a horizontal stabilizer is attached complete with winglets of constructed composite-carbon material. A aluminium mast is affixed to the fuselage structure, on which the control head with the rotor is mounted.

The two-blade rotor of aluminium structure is manufactured and delivered as a set (blades plus a hub) by the AVIATION Artur Trendak Company. The blades NACA 8H12, made from drawn aluminum, are entirely anodized and perfectly balanced.

The **TERCEL Carbon** is powered with a **AAT 912 RSTi** engine. It is equipped with a three-blade composite propeller KASPAR Aero 2/3 LT, which has the capability to manually change pitch.

The undercarriage is a stationary three-wheel one in a set with the front wheel. The main legs are elastic and made of composite. The front leg is dampened with a wheel pneumatic unit. The undercarriage can be made as "ordinary" with wheels with a diameter of 350mm.

The spacious cabin with a width of 136 cm is accessible through a large door on the left and right sides. Rich glazing ensures optimum visibility. Two ergonomic seats can be set up. Each chair is equipped with adjustable four-point belts.

1.3.1 General Data

Geometric data

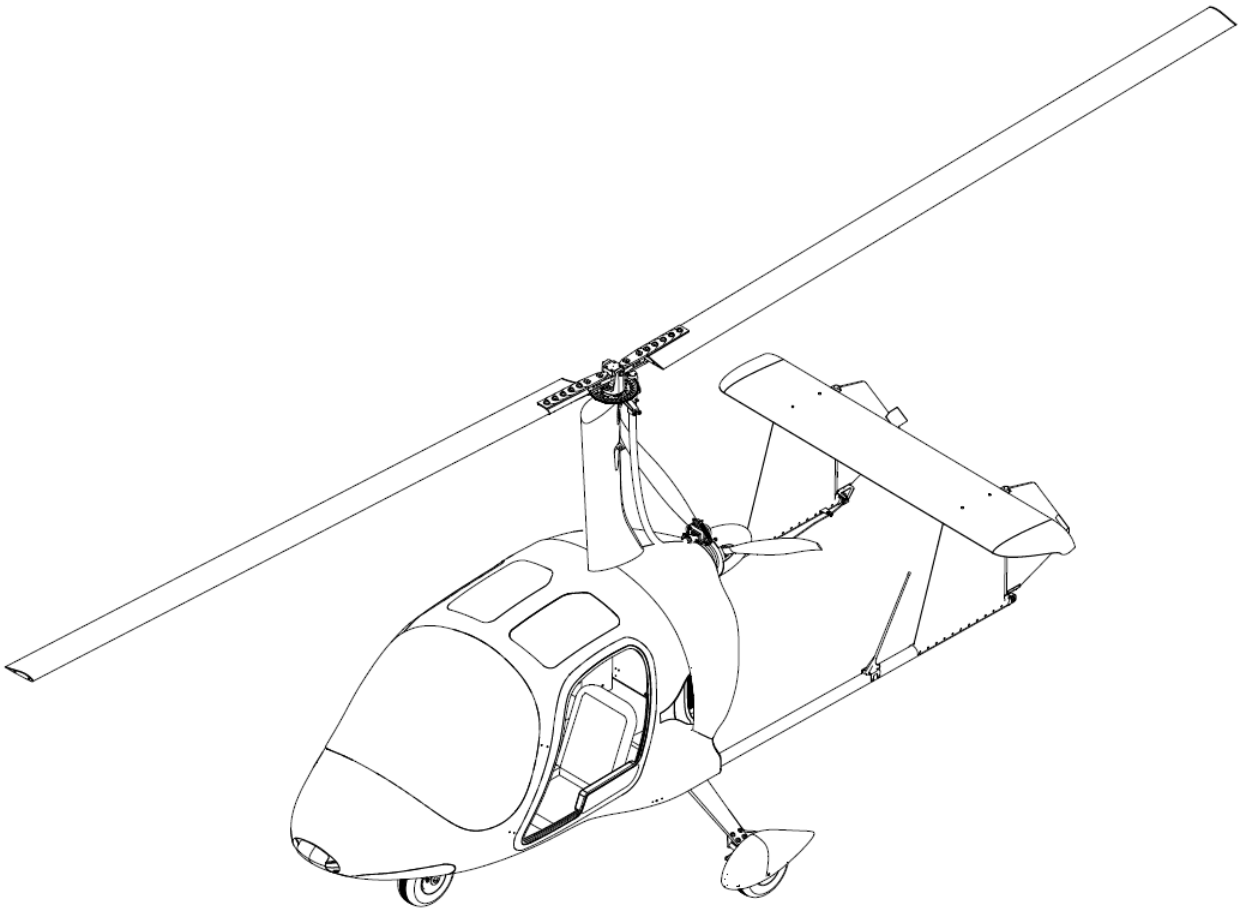
Rotor diameter	8.60	m
Rotor surface	58,06	m^2
Rotor blade chord	0.20	m
Overall length (without rotor)	5.04	m
Fuselage width	2.35	m
Track of wheels	2.20	m
Cockpit width	1.36	m
Overall width	2.35	m
Overall height	2.87	m
Wheel diameter	0.35	m
Landing gear:	"ordinary"	

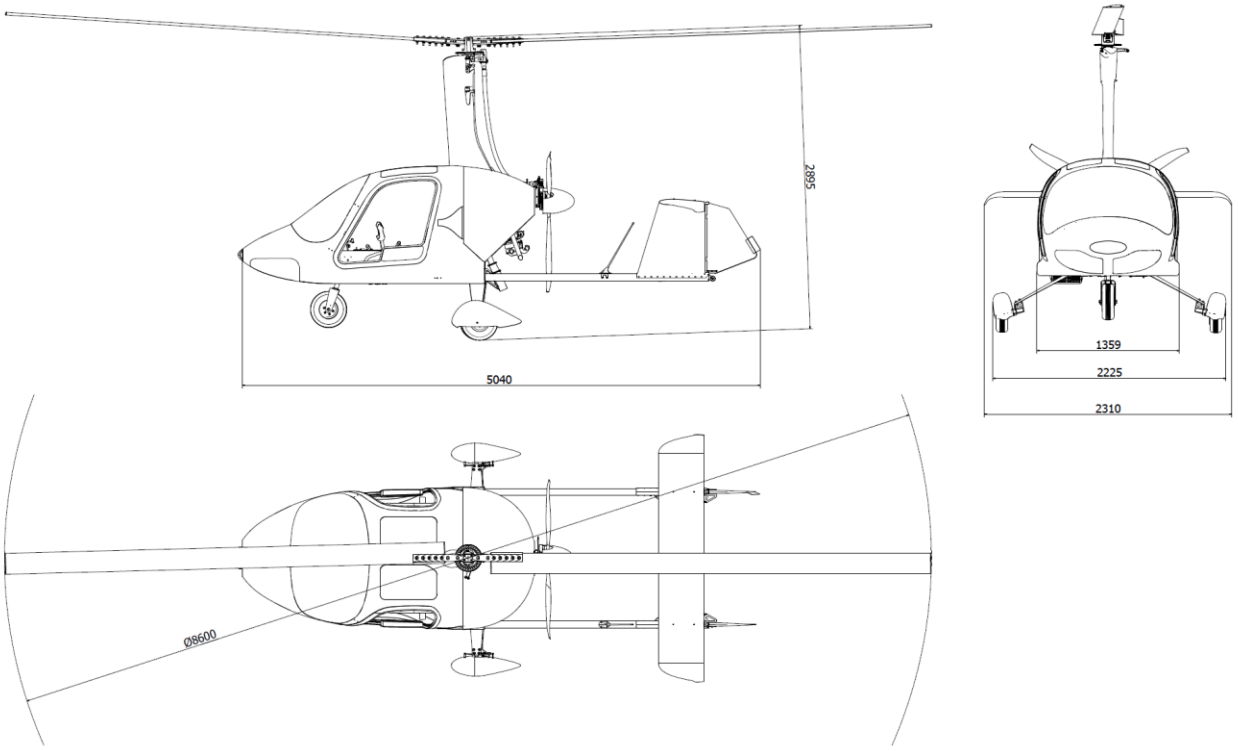
Weight data

	kg	lb
Maximum take-off weight	560	1235
Empty weight	332	731
Load capacity	228	502

Data of the power unit

Engine type	AAT 912 RSTi
Power	140 KM at 5800 rpm
Reducer ratio	1 : 2.43
Propeller	KASPAR Aero 2/3 LT
Propeller diameter	1.72 m
Propeller max. speed	2263 U/min
Propeller pitch	15,3° at 645 mm or 75%radius
Capacity of the fuel tanks	80 litres (2x40l)

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Chapter 2 Restrictions

2.1 Introduction

Chapter 2 embraces the restrictions of usage, markings of instruments and basic plaques, crucial to the safe usage of the gyrocopter, its engine, standard systems and standard equipment.

2.2 Flight Speed

Speed restrictions and their importance in usage are presented in the table below:

	Speed	IAS [km/h]	IAS [kt]	Notes
V_{NE}	Speed never to be exceeded	182	98	Do not exceed this speed in any usage.
V_{NO}	Maximum structural cross-country speed	175	94	Do not exceed this speed, except for tranquil atmosphere and exercising with caution.
V_a	Manoeuvring speed	130	70	Do not perform full or violent movements with the control surfaces above this speed, because with certain conditions, the full movements of the control surfaces can cause the overload of the gyrocopter.
V_{min}	Minimum speed	65	35	The minimum speed of established horizontal flight.

CAUTION!

During a steep ascent or descent, the speedometer indications are burdened with error due to change of the fuselage angle of attack.

2.3 Speedometer Markings

Marking	value or range		Notes
	[km/h]	[kt]	
Green arch	0÷175	0÷94	Range of normal usage
Yellow arch	175÷182	94÷98	Warning range
Red line	182	98	Never-exceed speed (V_{NE})
Yellow triangle	100	54	Flight speed at the best ascent speed (V_Y)

Moreover, one of the speed placards below must be installed on the instrument panel in front of the pilot (corresponding with the units for scaling the speedometer):

IAS	V_{NE} = 182 km/h	V_Y = 100 km/h	V_a = 130 km/h 1 person
	V_X = 90 km/h	V_{min} = 65 km/h	V_{a1} = 130 km/h 2 people

IAS	V_{NE} = 98 kt	V_Y = 54 kt	V_a = 70 kt 1 person
	V_X = 49 kt	V_{min} = 35 kt	V_{a1} = 70 kt 2 people

2.4 Driving Unit

Engine model	**AAT 912 RSTi**

	Power	RPM	Manifold Pressure
Maximum Take-off Power	140KM	5800	max. 45,5 inHg
Maximum Continuous Power	135KM	5500	max. 45,0 inHg
75% Take-off Power	105KM	-	max. 40,0 inHg
Idle	-	1450	max. 31,5 inHg

Oil type	AeroShell Oil Sport PLUS 4 - 10W40		
	minimum	normal	maximum
Oil temperature	50 ºC	90-110 ºC	140 ºC
Oil pressure	0,8 bar (above 3500RPM)	2-5 bar(above 3500RPM)	7 bar

Fuel (type)	Lead-free car petrol with the minimum octane number of 95, recommended 98
Min. fuel pressure	3 bar
Max. fuel pressure	4,5 bar
Maximum coolant exit temperature	120 ºC
Maximum cylinder head temperature	135 ºC
Propeller manufacturer	KASPAR AERO
Propeller model	Ka-2/3-LT
Propeller diameter	1.72 m
Propeller blade angle	16º (in measurement section, in accordance with the propeller manual)

2.5 Rotor Rotational Speed

Rotor rotational speed	rpm
normal at maximum weight (MTOW)	360 - 380
normal at minimum weight (~332 kg)	330 - 340
during autorotation	310 ÷ 330
minimum for level flight	270

minimum until the full opening of the throttle during take-off	**180**
maximum for using the rotor brake	**150**

WARNING!

Load Factor below 1g during flight cause the rotor rotational speed to fall and if maintained, it can lead to the buffeting of the rotor blades and a disaster.

2.6 Rotor Tachometer Markings

Marking	Value or range [rpm]	Notes
Red line	180	Minimum until the full opening of the throttle at take-off
Red arch	270÷290	Warning range
Green arch	290÷380	Normal range
Red arch	380÷500	Warning range

WARNING!

Never exceed the rotor speed of 566 U/min!

2.7 Weights

Maximum take-off weight (MTOW)	560kg	1234 lb
Nominal proper weight *	332 kg	731 lb
Minimum crew weight	60 kg	132 lb
Maximum crew weight	210 kg	462 lb
Maximum one person weight	110 kg	242 lb
Maximum fuel weight	61 kg	134 lb
Maximum luggage weight	2×10 kg	2×22 lb

* - the actual proper weight for a particular model is written in the current weighing report and in subsection 6.4 of this manual.

The current take-off weight is equal to the sum of the proper gyrocopter weight and the weights of the crew, luggage and fuel. Under no circumstances, do not exceed the approved maximum take-off weight (MTOW) equal to 560 kg (1234 lb). Proposed load sheet is presented below.

	Weight	Minimum	Maximum
Nominal proper weight		----------	----------
Crew weight			
Fuel weight			

Luggage weight			
Total			

WARNING!

Flying the gyrocopter with a weight exceeding the admissible one is punishable by insurance invalidation, and even a disaster!

Space under the seats (15 dm^3) can be burdened with a maximum of 10 kg (22 lb).

During solo flights, it is recommended to place a ballast on the board (on the seat fastened with seat belts) to ensure the appropriate balancing of the machine. A ballast in the form of a sack of sand or a can of water is recommended. The ballast must be protected against movement. Ballast size is specified below:

Pilot left seat weight [kg]	Ballast right seat [kg]	Ballast right seat [lb]
50 ÷ 60 kg	12 kg	26 lb
60 ÷ 80 kg	10 kg	22 lb
80 ÷ 100 kg	8 kg	18 lb

Pilot right seat weight [kg]	Ballast left seat [kg]	Ballast left seat [lb]
50 ÷ 60 kg	15 kg	33 lb
60 ÷ 80 kg	13 kg	29 lb
80 ÷ 100 kg	11 kg	24 lb

2.8 Position of the Centre of Gravity

The position of the centre of gravity of the gyrocopter (a sideways view) is specified through the value of the angle whose apex is located on the transverse axle for rotor head suspension on the mast, one arm is parallel to the vertical axis of the coordinate system related to the fuselage, and the other arm passes through the centre of gravity of the gyrocopter. (See subsection 6.3).

The admissible range of the position of the centre of gravity of the gyrocopter in flight:

280 ÷ 430mm

Observing the conditions of the admissible load and the proper position of the centre of gravity of the empty gyrocopter ensures maintenance in the above range of the positions of the centre of gravity!

2.9 Compass Correction Card

N	30°	60°	E	120°	150°
358°	29°	60°	91°	123°	151°

S	210°	240°	W	300°	330°
181°	211°	239°	271°	302°	329°

Compass Correction Card

2.10 Approved Manoeuvres

The **TERCEL Carbon** gyrocopter has been classified in the ultralight aircraft category and is subject to the regulations which state that it can be used solely as a non-aerobatic one!

The non-aerobatic model of usage embraces:

- any manoeuvres occurring in flight,
- stalls,
- lazy eights,
- vertical zooms,
- steep turns in which the roll angle does not exceed 60º

WARNING!

All aerobatic manoeuvres and turns with a roll angle of more than 60º are forbidden!

2.11 Manoeuvre Load Factor

Admissible manoeuvre load coefficients: **0/+3**

2.12 Crew

The gyrocopter is a two-seater with a doubled flight control system.

Minimum crew: 1 pilot.

The pilot's place in a solo flight - depending on the configuration of the instrument board and the position of the wheel brake lever.

2.13 Sorts of Usage

This gyrocopter can be used for leisure, sports, display purposes, for training, practice, exclusive of air carriage and other reasons. Flights can be performed in the Visual Meteorological

Conditions (VMC) covered by Visual Flight Rules (VFR). Specific usage of gyrocopter is described in Certificate of Registration given by Aviation Authority of country of registration.

2.14 Fuel

capacity of the fuel tanks		80 dm^3
admissible quantity of fuel in the tanks		80 dm^3
including	consumable fuel	78 dm^3
	non-consumable fuel	2 dm^3

2.15 Wind speed restrictions

The admissible values of wind speed during flight and landing:

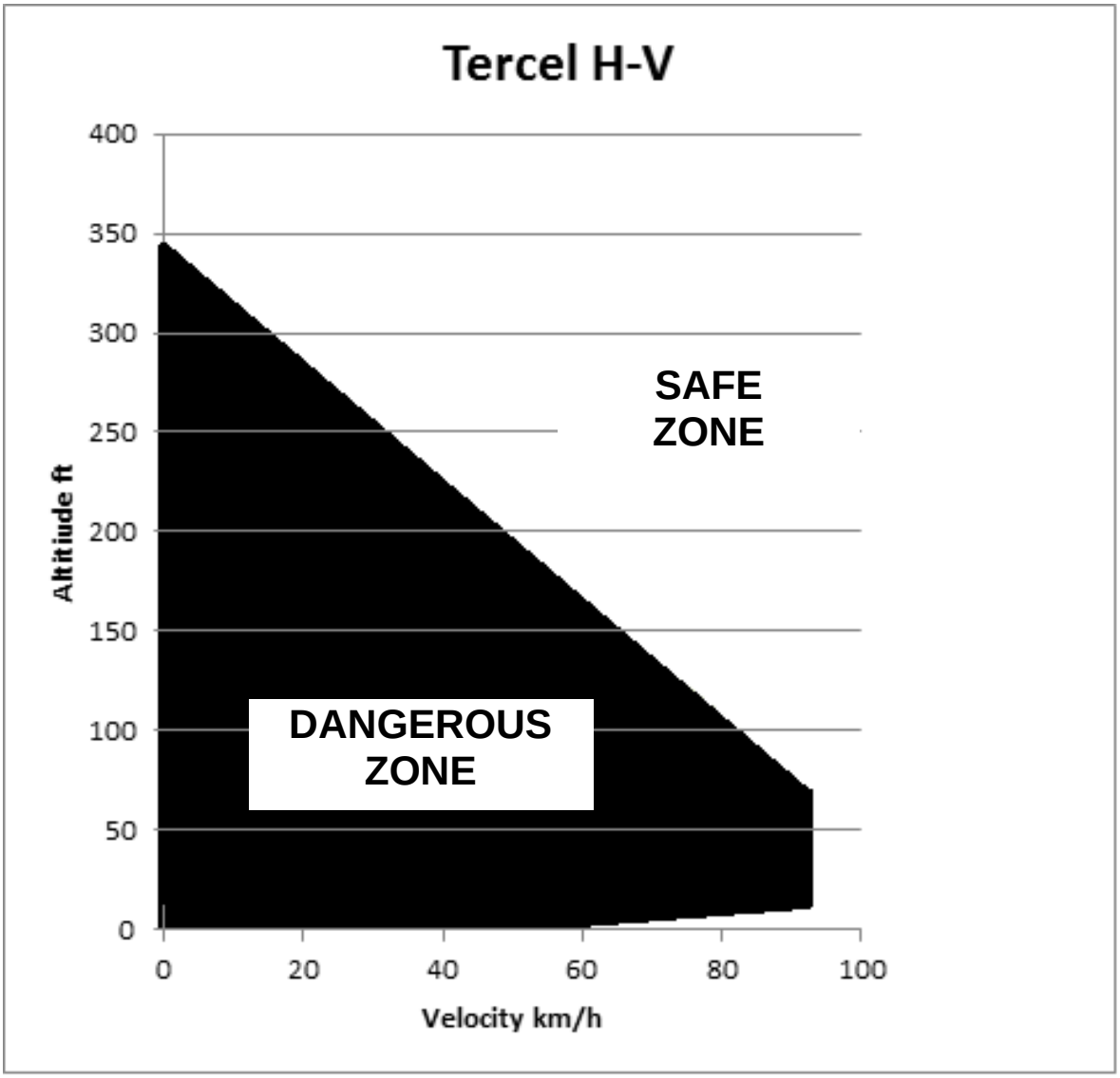
direction of wind	speed
frontal	60 km/h
sideways (90º)	30 km/h
rear	0 km/h

2.16 Other Restrictions

It is forbidden to perform:

- aerobatics,
- turns in which the roll angle exceeds 60º,
- flights in the icing conditions,
- flights when wind speed exceeds 60 km/h,
- flights in the conditions of severe turbulence,
- flights above areas with dense built environment.

DIAGRAM: HEIGHT - SPEED



Chapter 3 Emergency Procedures

3.1 Introduction

Chapter 3 contains activities to take if an emergency condition occurs during ground operation, take-off or in-flight. These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Since emergencies rarely happen in modern gyrocopter, if proper pre-flight inspections and equipment maintenance are applied, their occurrence is usually unexpected and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to appropriate action when an emergency arise.

Most basic emergency procedures, such as power off landings are a part of normal pilot training. However, these emergency situations are also discussed here. This information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all gyrocopters. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

CAUTION:

Plan the flight route so as to allow for potential emergency landing.

3.2 Engine Stops to Work

3.2.1 During Take-off

- Evaluate the flight level. If you are above 250 ft (80 m), you can turn back to land. If are lower, keep up the direction straight ahead.
- Reset the throttle to the “minimum” position.
- Deactivate the magnetos and the electrical master switch(red key).
- Land, attempting to avoid both possible obstacles and violent manoeuvres resulting with loss of rotor rotational speed.

3.2.2 During Flight

- If you have the sufficient flight height, attempt to start the engine in flight (subsection 3.3).
- If the height is too small or attempts to restart the engine have not succeeded, perform emergency landing (subsection 3.6).

3.3 Starting the Engine in Flight

- Proceed to gliding.
- Make sure all the switches are in an appropriate position - the master switch and the magnetos are ON.
- To start the engine, reset the throttle lever to the “minimum” position.
- Activate the starter.
- After starting the engine, boost the throttle gradually.

3.4 Smoke or Fire

3.4.1 During Taxiing

- Reset the throttle lever to the “minimum” position.
- Close Fuel Shut-off valve.
- Deactivate the magnetos and the master switch(red key).
- Stop the machine and leave it as fast as possible.
- Use an appropriate fire extinguisher if available.

3.4.2 During Flight

- Close Fuel Shut-off valve.
- Deactivate the magnetos and the master switch(red key).
- Use an appropriate fire extinguisher if available.
- Perform Emergency Landing(subsection 3.6)

3.5 Engineless Flight

Flight with engine shut-off can be safely performed in the full speed range. However, approaching the ground, observe the restrictions following from the “height - speed” diagram (page 2-7). In case of a vertical descent, commence accelerating the gyrocopter at a height of 80-100 m above the ground to be able to land safely.

The highest glide ratio equals 3:1 at speed 100 km/h (54 kt); then the machine heads for an area seen in the bottom window.

3.6 Emergency Landing

- Maintain 100 km/h (54 kt) to achieve best glide ratio.
- Chose landing spot.
- Land, attempting to avoid both possible obstacles and violent manoeuvres resulting with loss of rotor rotational speed.
- Engage rotor brake as fast as possible after touchdown.
- Stop the machine, apply full rotor brake and prepare to leave.
- Leave the machine as soon as the rotor stops.

3.7 Tyre Crack at Take-off/Taxiing

- Deactivate the magnetos and the master switch.
- Interrupt the take-off.
- Attempt to keep up the direction by means of the pedals and the brake.

3.8 Blocking of the Throttle Lever during Flight

- Attempt to move the lever in order to unblock it.
- Choose an appropriate spot for landing.
- Deactivate the magnetos when you are within reach of places for touchdown.
- Perform emergency landing.

Chapter 4 Normal Procedures

4.1 Introduction

Chapter 4 states a list of check activities and a description of procedures for performing normal operation. Normal procedures related to the optional systems are included in Chapter 9.

4.2 Attaching the Rotor

The blades and the hub are provided with the numbers specifying their orientation in the assembly kit. By matching the alphanumeric markings, insert the rotor blades into the sockets in the hub. Install using five M10x65 bolts each (with the washers on both sides) clipping the hub beams with each blade. Next, screw all ten nuts to the first contact.

Even out the rotor blades by using stretched string, going through the centre of the hub and along the grooves at the blade tips. The rotor must be placed on two supports with a soft surface (to avoid damage) so that the strained string goes about 1 cm above the central opening in the hub. If the rotor is not aligned properly, it will result in vibrations in flight. The better the alignment of the rotor, the greater the comfort of flight, the smaller the vibrations and the longer the life of the machine and its subassemblies. When the string does not overlap the hub axle, two people are needed for help: hold down the blade tips, then push the hub in the right direction. After alignment, tighten the nuts with a torque spanner, first 30 Nm, next 45 Nm.

The correctness of alignment must be checked in the first flight.

Installation of the Rotor on the Gyrocopter:

- Make sure the wheel brakes are activated (position 1).
- Fix the control stick in the extreme front position so that the rotor head disc rests on the brake.
- Lubricate the pin for rotor hub suspension on the head (teeter bolt) and the slip sleeves with a dedicated lubricant (WHS2002).
- With the help of another person (and a ladder), raise the rotor and place it on the head.
- Insert the pin through the head and the hub (making sure the sleeves remain in their places) and press it down to the end.
- Tighten the nut, next unscrew it by 1/4 of a rotation and pass the safety cotter pin through the opening at the end of the pin.
- Check rotor head movement range.

CAUTION: **When placing the rotor, you must stand on the fuselage only in the spots designated for this purpose!**

4.3 Daily Inspection

Most of technical faults can be detected during a careful check before flight. The safety of operation depends on regular and detailed inspections and services. An inspection should, according to the plan below, be conducted before the first flight on a given day, if possible in the presence of a qualified person (e.g. a pilot) to operate the machine correctly and avoid an accidental start.

General	• Check the magneto switches operate correctly (mechanically) and set them up in the deactivated position (OFF). • Remove frost, snow, ice or mud, if any. • Check the gyrocopter documents validity and proper maintenance performed. • Ensure that all loose equipment is properly fixed and unnecessary components are removed from the gyrocopter. • If the gyrocopter has not been regularly utilized lately, before you renew flights, make sure: - the engine has been started every two weeks or other manufacturer's recommendations have been met; - the faults reported before have been taken into consideration.
Glazing	• Check if it is clean (clean if necessary) and there is no damage. **CAUTION: It is not allowed to use fluids containing alcohol !**
Fuselage	• Check the outside surfaces, tail beam pipes and their mounting in the fuselage, the rotor mast and its mounting in the fuselage, available inside structure of the fuselage for damage, corrosion, cracks and ensure all components are protected and secured. • Check the drainage and ventilation holes are not clogged. • Check the radio antennas are not damaged and are secured.
Tail	• Check the reliability of the fixing of the vertical stabilizers to the tail beams and the horizontal stabilizer to the vertical stabilizers. • Check the condition of the composite surfaces of the stabilizers and rudders for delamination or other damage. • Check the condition of the Bowden cables and their connection to the control surfaces. • Check the rudder hinges. • Check the tail wheels.
Undercarriage	• Check if static deflection of the undercarriage seems correct. • Check the condition of the undercarriage legs. Check wheel axles and hubs for damage, corrosion, cracks and the protection of all components. • Check the condition of connection of the undercarriage legs with the fuselage structure for cracks or play. • Check the tyres are properly inflated (2.5-4 bars), are not damaged or worn-out. • Check if the braking system is not damaged and has no evident leaks; check the level of brake fluid. • Check the bolts fixing the brake discs (2x4 pieces) are tightened. • Check the front leg rotates freely and the pushers are fixed correctly.

Flight control systems	• Check the pedals, rudders and the front wheel operate properly and in the full range - from one stop bar to the other. To be able to freely move the rudder, raise the front wheel, pressing the horizontal stabilizer (in the place it is fixed to the vertical stabilizer) • Check the condition of pedals, their secure attachment, whether they have no cracks in the welds as well as jams and movement limitations. • Check the control stick moves fluently in the full movement range (between the stops), the stick movement corresponds with the proper movement of the rotor head. • Check mechanical connections between the control stick and the rotor head whether there are no loose bearings or components, bent or damaged pushers or excessive resistance. • Check the condition and operation of the electric trimmer.
Driving system	• Replenish (if necessary) the oil tank and the cooling fluid tank with appropriate fluids. • Check the cooling lines (water and oil) are not cracked. • Check all the fixing springs (protected with wire - where suitable), in particular those fixing the exhaust system and the turbocharger. • Check the exhaust system and the turbocharger for secure attachment, cracks or leaks, and whether wrappings from ceramic tapes are in good condition etc. • Check the air filters are clean and securely fixed. • Check the engine suspension for secure attachment and rubber components for cracks and excessive wear. • Check the spark plugs and their caps are securely fixed. • Check the condition of the water and oil coolers, their fixing and make sure there are no leaks. **Caution:** check all the soldered connections for signs of cracks. • Check the components of the engine control system - the full and free movement range in the right direction. • Check all the wires running “freely” around the engine for proper attachment and connection. • Make sure both covers of the inspection windows are properly closed and protected with quarter-rotational locks.
Propeller	• Check propeller blades and the hub for cracks and damage. • Check if propeller blades are securely mounted to the hub, and the hub to the engine shaft (all the bolts/nuts in the kit and protected with the safety wire). • Check if propeller and engine rotate steadily (in the normal direction) without excessive noise etc. (ignition deactivated (OFF) and the throttle at minimum!). **Remember! The engine can start! If possible, put the wedges under the wheels and/or activate the brakes!** • Check the components of Variable Pitch Propeller. Propeller before the start must be set with the minimum angle of attack, pitch change knob turning left (counter-clockwise).

Fuel system	• Check both fuel tanks, regarding condition and secure attachment; make sure there are no leaks; check the fuel filler is sealed and secured; check the fuel gauge and compare it with the visible level of fuel in the tanks; check the operation of the fuel shut-off valve; check the fuel settling tank has no water inside. • Check if fuel system conduits and their fixing are not slit, rotten or bent. • Check if fuel filters are not polluted and have no water inside.
Rotor	• Check the rotor head, its condition and freedom of rotation. • Check the bolts and nuts fixing the blades to the hub. • Check visually blades for scratches, nicks, signs of cracks or other damage (the blades must be clean!). • Check the rotor swings freely against the head and in the full range between stops.
Prerotation mechanism	• Check the V-belts for damage / delamination. • Check the pretoration sheave for damage / cracks. • Check whether the rotor - drive transmission system works freely and is lubricated. • Check the console of the prerotation clutch mechanism fixed to the engine for cracks or other damage. • Check whether prerotation brake operates correctly - it should block movement when pulling down the V-belts on the left side. The clutch cable should have several millimetres of clearance, no tension.
Cabin	• Check the doors, their hinges and locks operation. • Check the safety belts for rubbed spots or other damage, secure attachment, and the fastening mechanism for correct operation. • Check seats for proper attachment to the cabin floor. • Check readings from the instruments correspond with the surrounding conditions. • Check the wiring harness for traces of overheating or other damage. • Check the operation of the electrical circuits. • Check the operation of radio and other electric instruments and whether battery is charged. • Check the stickers and placards are legible.

Pre-flight Inspection

Before every flight, the pilot must perform an overall visual check of the whole gyrocopter. Any disturbing observations should be passed to competent people, and a flight cannot be started with an appropriate explanation or the removal of a possible fault.

Moreover, it is essential to:

- Specify the volume of a load in order not to exceed the admissible limits. In case of a solo flight, place and fix appropriate ballast or luggage on the floor in front of the empty seat.
- Specify the fuel level (replenish if necessary).
- Adjust the chairs, fix the luggage - there can be no loose objects in the cockpit.
- In case of a solo flight - close the doors and fasten the belts on the side of an empty seat.
- Check the freedom of movement of the flight controls (when checking the rudder pedals, lift the front wheel, pressing the horizontal stabilizer).

4.4 Before Starting the Engine

If the engine is cold, all the oil flew back into the oil tank. Oil must be sucked again into the engine. To do it:

- make sure the magnetos are deactivated;
- the throttle is on idle;
- the wheel brakes are activated (position 1);
- rotate the propeller manually anti-clockwise until you hear the first bubbling from the oil tank;
- perform 10 more rotations to fully remove the air from the oil circulation;
- from the cockpit: (free space around the propeller, magnetos deactivated) activate the starter for a maximum of 10 seconds, checking the value of oil pressure - it should amount to a minimum of 1 bar;
- if the pressure is too low, repeat the previous operations.

4.5 Starting the Engine

CAUTION!

The engine can only be started by person trained to operate the aircraft

- Block the control stick with strap in the extreme front position.
- Activate the master switch.
- Activate the electric fuel pump.
- Set the throttle (the black lever) in the idle position (entirely backwards).
- Activate both magnetos (upwards).
- Make sure all the other electronic switches and instruments are deactivated.
- Ensure the space around the propeller and rotor is free.
- Make sure the wheel brakes are activated (position 1).
- Make sure the Propeller is reduced to minimal pitch before the start.
- Pull the choke lever (blue) if necessary (depending on the temperature of the surroundings and the engine). To start the cold engine, use full choke and the throttle in the maximum position; otherwise choke does not operate properly. When the engine is warm do not use choke.
- Check “Clear Propeller Area”
- Press the starter button until the engine starts working (a maximum of 10 seconds).
- After starting the engine all the necessary devices can be activated.
- Deactivate choke.

- Warm up the engine at about 2000 rpm, next at 2500 rpm until the oil temperature in the engine reaches 50°C.

4.6 Check after Starting the Engine

- If any of the parameters is beyond the normal range, turn off the engine and check the cause.
- Check the oil pressure. If it does not raise monotonically to the normal value (2-5 bars), deactivate the engine and find the cause.

  Engine Check:
- Magnetos check: at about 3000 RPM, turn off one of the magnetos. The maximum expected drop should be 200 RPM. Turn magneto on. Repeat analogically for the second magneto

4.7 Taxiing

- For safety reasons, it is recommended to stop the rotor during taxiing.
- Taxiing should be performed with a small speed (5÷20 km/h), with the rotor immobilized with the brake (it is recommended to set the rotor along the axis of the machine).
- Make sure the pedals operate correctly. Pressing the left pedal must cause a turn to the left, the right pedal - to the right.
- Check the brakes. Avoid using brakes during turns, because it causes the hindered operation with the pedals and leads to the unnecessary overload on the front wheel and the pedals.

4.8 Check before Take-off

Make sure:

- quantity of fuel is sufficient (recommended visual inspection of fuel in tank);
- doors are closed;
- seats are set up appropriately and the belts fastened;
- choke disengaged;
- trimmer is loose;
- the gyrocopter is set up against the wind;
- condition of the runway and its length are appropriate;
- radio is operative.

4.9 Prerotation and Take-off

- (If prerotation belts were replaced, it is recommended to powder them with talc)
- Set brakes on
- Unlock control stick
- Check control stick movement range
- Set control stick in neutral position
- Set throttle to idle
- Pull prerotation engaged until Bendix turn on (characteristic sound)
- After Bendix turns on, hold prerotation lever on in position until rotor accelerate to 100 RPM
- Firmly continue pulling prerotation lever until rotor revolutions stop accelerate(this means prerotation system has been synchronized)
- Set prerotation to fully engaged
- Set throttle lever so the rotor revolutions reach 150RPM and then pull the control stick ~10cm and hold on until rotor reach 180-200RPM
- Set prerotation to fully disengaged
- Make sure the prerotation mechanism is deactivated.
- Release the wheel brake.
- Pull the control stick backwards and gradually accelerate.
- At a speed of 40 km/h (22 kt) gently lift the front wheel, observing attitude of gyrocopter.

Prerotation lever is a red lever in central console. Bendix mounted on gyrocopter is mechanical type.

CAUTION:

After setting prerotation lever to prerotation position, prerotation clutch is engaged Bendix is turned on and rotor is accelerating. It is forbidden to apply prerotation.

CAUTION:

The bow tends to lift off the ground prematurely. Attempt to keep the front wheel about 10 cm above the ground. The bow lifted too high can lead to an unintended take-off at insufficient speed and too large rotor angle, which can lead to an ascent at a dangerous angle. The machine nose has a low section, therefore it is essential to watch for optical illusions in evaluating the height above the ground.

- Increasing the throttle, watch for the deflecting moment coming from the propeller and compensate for it by using the rudder pedals.
- The lift-off speed is about 85÷90 km/h (46÷49 kt). After lift-off, accelerate the gyrocopter just above the ground to the speed of 105÷110 km/h (57÷60 kt).

- Start an ascent, controlling the position of the gyrocopter and the engine parameters.

CAUTION:

Pay attention to optical parallax, as you do not sit at the aircraft axis. Move the stick in the right manner. Do not move it diagonally if you want to make a move forwards or backwards. It is recommended to practise this reflex on the ground with an instructor.

4.10 Climb, Cross-Country Flight, Descent

- Controlling climb and descent is performed by moving the throttle lever coordinated with the movement of the control stick. An optimal climb speed is 105 km/h.
- Climb: increase the engine rotational speed, by moving the throttle lever forwards.
- Descending: decrease the engine rotational speed, by moving the throttle lever backwards.
- A cross-country speed depends on the take-off weight, the engine rotational speed and atmospheric conditions.
- Trim: Trim the gyrocopter till it fly straight and level.
- The TERCEL Carbon is designed so as to react to the pilot's instructions in an intuitive and normal manner: increasing throttle causes climb, reducing throttle causes descent.

4.11 Approach and Landing

- Choose an appropriate area for landing, check the movement of other aircrafts around, by using a radio, and specify the direction and speed of wind.
- Check the descent speed by using the throttle lever and control stick.
- Maintain the appropriate approach speed (about 95 km/h (51 kt)).
- It is crucial to avoid sudden sideways movements.
- Make sure the front wheel is straight.
- DO NOT FORGET, to reduce back to minimal pitch prior landings and touch and go. This can be considered as a risky situation if not executed correctly, as the engine will not deliver the proper power on re-acceleration.
- On an appropriate level, initiate roundout so as to align just above the ground and touch down gently.
- Remember landing **does not finish** when all the wheels touch the ground.
- Perform the landing run along the straight line until you stop; do not turn during the landing run!
- Check the rotor until it stops completely.
- Use the brake below the speed of 150 rpm until it stops.

CAUTION!

In case of strong sideways wind, plan the landing with the shortest possible landing run, and during the landing run tilt the control stick in the direction against the wind (the wind from the left - the stick to the left)

4.12 Turning off the Engine

CAUTION!

Every engine with the turbocompressor must be cooled after flight.

- Allow the engine to work at low rpm (1650 rpm) for about 5 minutes (all the parameters must stabilize).
- Deactivate the magnetos and the master switch.

4.13 Post-flight Inspection

After flying, the pilot should perform an overall visual check of the whole gyrocopter. All disturbing observations should be passed to competent people. Also, if there are any abnormal situations during flight, it is central to notify competent people of them and perform adequate actions.

4.14 Detaching the Rotor

The rotor must be detached from the gyrocopter for transportation, and in case of longer hangar storage.

NOTE: **When detaching the rotor, you must stand on the fuselage only in the spots assigned for this purpose!**

- Make sure the wheel brakes are activated (position 1).
- Set up and immobilize control stick using strap in the extreme front position so that the rotor head disc rests on the brake.
- Remove the safety cotter pin and unscrew the nut from the pin for rotor hub suspension in the hub (teeter bolt).
- With the help of another person holding down the rotor, tuck out the pin (making sure the sleeves remain in their places) and remove the rotor from the head.
- Unscrew the nuts, withdraw the M10x65 bolts (10 pieces) and tuck out the blades from the sockets in the hub.
- Piece together and assemble back the hub, sockets, M10×65 bolts, washers and nuts.
- Place the pin (teeter bolt) in the hub with washers, screw on a nut and pass through the cotter pin (safety pin).

The removed blades, for storage or transportation, must be appropriately fastened and protected against damage.

Chapter 5 Performance

5.1 Introduction

Chapter 5 includes information regarding flight speed and performance during take-off, climb, cross-country flight and landing, and also data about noise.

Unless stated otherwise, the values refer to take-off weight equal to 560 kg and standard atmosphere conditions.

5.2 Characteristic Speeds [IAS]

		[km/h]	[kt]
Never-Exceed Speed	V_{NE}	182	98
Maximum structural cross-country speed	V_{NO}	175	94
Normal cross-country speed at 75% of power	V_{C}	140	76
Flight speed at the best ascent speed	V_{Y}	100	54
Approach speed	V_{APP}	90	49
Manoeuvre speed (two people)	V_{a}	130	70
Manoeuvre speed (one person)	V_{a1}	130	70
Minimum speed	V_{min}	65	35

NOTE:

The actual speed distinctly differs from the speed indicated during a steep climb, descent and in autorotation due to a change of the angle of attack.

5.3 Take-off

Lift-off speed is about 85÷90 km/h (46÷49 kt).

Standard take-off run is about 80 ÷ 110 m (262 ÷ 361 ft).

Take-off distance to a height of 15 m (50 ft), after acceleration up to V_Y = 100 km/h (54 kt) ,is about 299 m (981 ft).

5.4 Climb

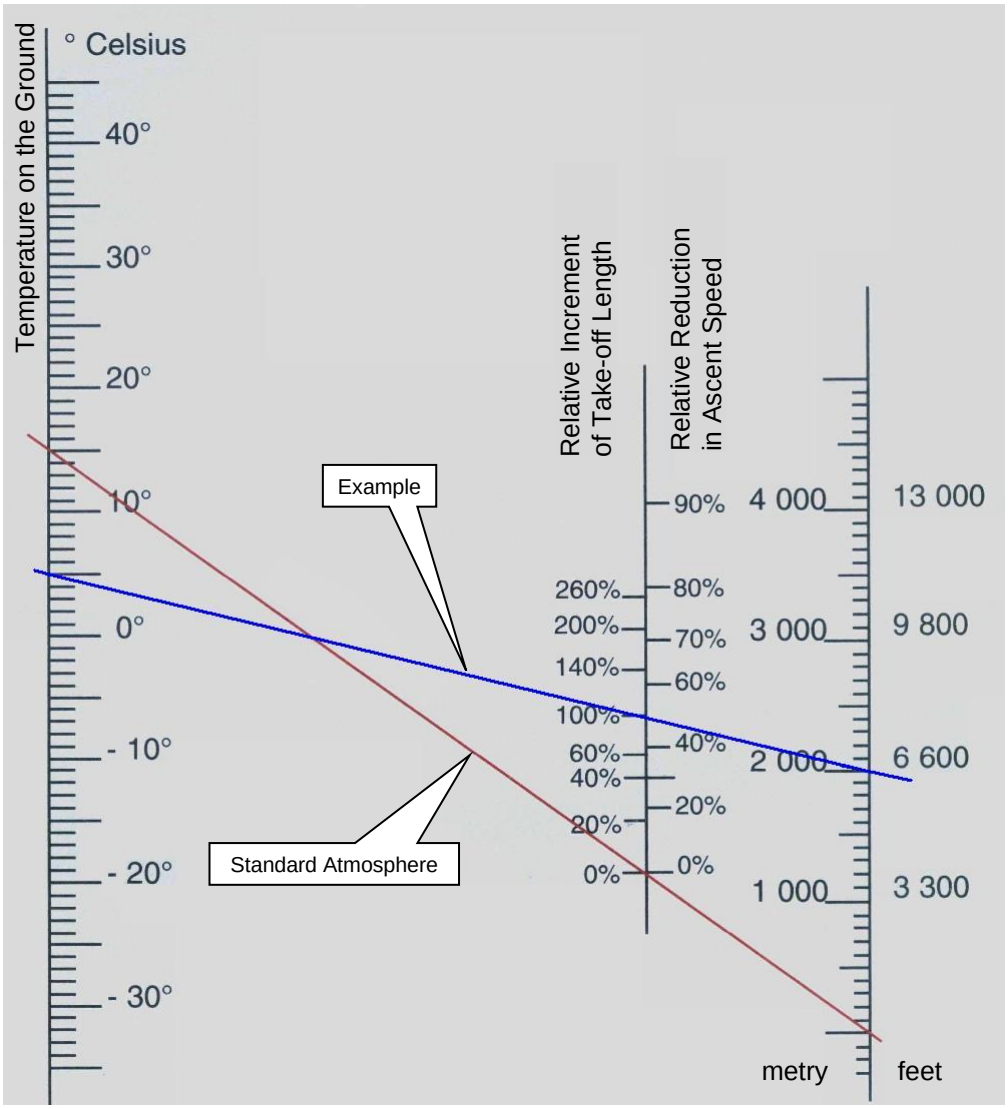
The maximum rate of climb at ground level, with a speed of V_Y = 100 km/h (54 kt), is about 6 m/s (1180 ft/min), and with a one-person crew it can reach 7 m/s (1380 ft/min).

The practical ceiling is 4500 m Above Sea Level (14 800 ft).

5.5 Diagram of Recalculating Take-off distance and Rate of Climb Depending on Air Temperature and Pressure

The diagram depicts the values applicable for light aircraft.

Important: The diagram is provided only for general information and shall not be applied without ensuring the appropriate safety margin.



Example:

Conditions at the take-off airfield: temperature 15 ºC, pressure matching an altitude of 2000 m.

Connect with a line the points matching the above values on appropriate scales.

At the point where this line intersects with the middle scale, read the results.

In the stated example, the take-off run distance will increase by 100% and the rate of climb will decrease by 50% in comparison with the values in standard atmosphere conditions.

CAUTION: Bad runway conditions (high grass, sand, mud, snow, etc.) can even make take-off impossible. Always make sure that the runway is in required condition.

5.6 Landing

Approach speed: V_{APP} = 90 km/h (49 kt),.

Landing from above the obstacle 15 m (50 ft): 45÷55 m (150÷180 ft).

Standard landing run: 0÷10 m (0÷33 ft).

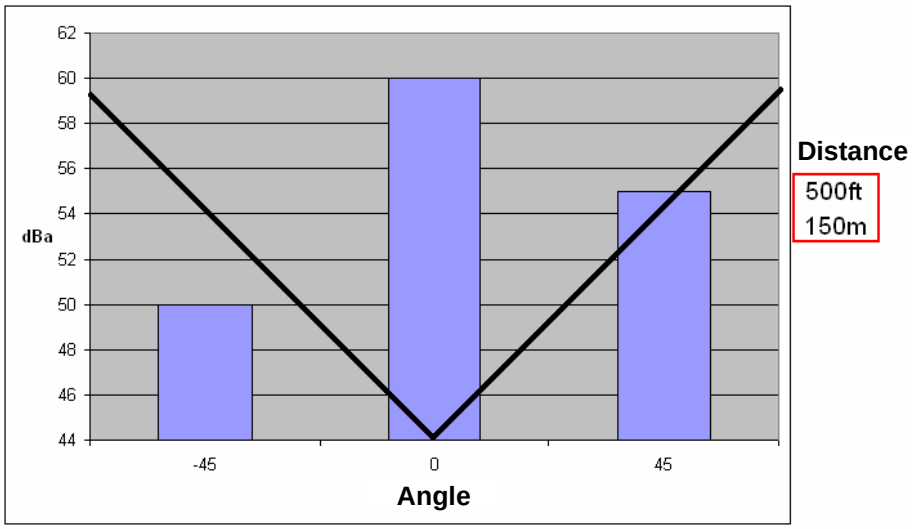
5.7 Range and Flight Endurance

Fuel consumption at a cross-country speed of V_C = 140 km/h (76 kt) is 20 dm^3/h.

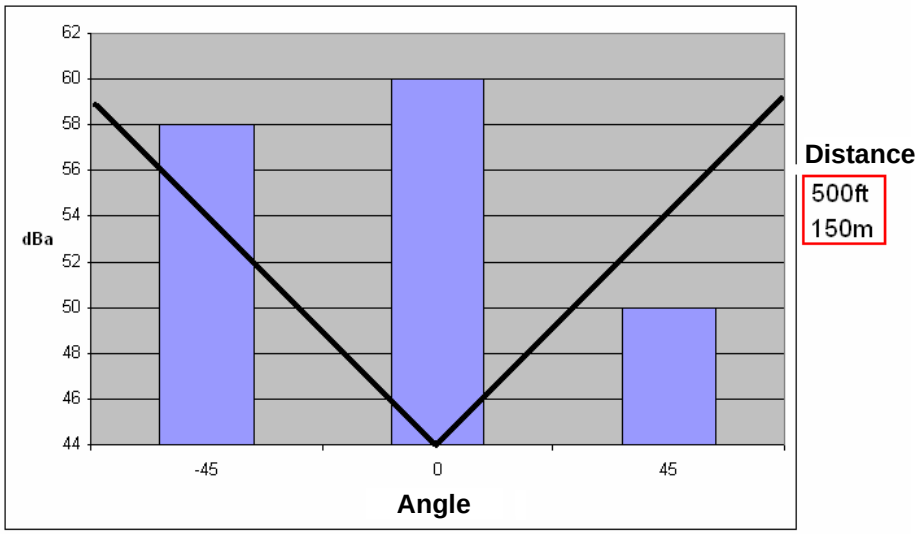
Hence, at take-off with the full fuel tanks (78 dm^3 of consumable fuel):

- Range is: 546 km.
- Flight Endurance is: 3 h 54 min.

Trial 1:



Trial 2:



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Chapter 6 Weights and the Position of the Centre of Gravity

Chapter 6 Weights and the Position of the Centre of Gravity

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6.4 Weighing and Specifying the CG Position by a Three-Scales Method…… 6-4
6.5 Entering the Weights and Position of the Centre of Gravity of the Empty Gyrocopter 6-6

6.1 Introduction

Chapter 6 includes information regarding the gyrocopter empty weight, the usable weight, and also the admissible load variants assuring the position of the centre of gravity of the gyrocopter is in the admissible range.

The way of weighing and specifying the position of the centre of gravity of the gyrocopter is stated in the Aircraft Maintenance Manual (document no. TERCEL-C-AMM-001-EN) in Chapter 6.

6.2 Weights

The maximum take-off weight (MTOW) is 560 kg (1234 lb).

The empty weight is 332 kg (721 lb), whereas the actual empty weight for a specific model is included in the up-to-date weighing report and is stated in subsection 6.4 of this manual.

The usable weight is a difference of the maximum weight and the empty weight. Calculate its value on your own (for the empty weight it is equal to 228 kg (502 lb)). The cargo weight, which embraces crew weights, luggage and fuel, cannot be greater than the usable weight.

Restrictions concerning load weights:

Minimum crew weight	60 kg	132 lb
Maximum crew weight	210 kg	375 lb
Maximum one person weight	110 kg	264 lb
Maximum fuel weight (78 dm^3)	61 kg	134 lb
Maximum luggage weight in the luggage compartment	2×10 kg	2×22 lb

The luggage compartment is located under the seats (a total of 15 dm^3) can be loaded with a maximum of 10 kg (22 lb). Luggage placed here must also be fixed so as to prevent the movement or scattering of its contents. The luggage weight should be included in the crew weight.

During solo flights, it is recommended to place a ballast on the board (on the seat fastened with seat belts) to ensure the appropriate balancing of the machine. A ballast in the form of a sack of sand or a can of water is recommended. The ballast must be protected against movement. Ballast weight is specified below:

Pilot left seat weight [kg]	Ballast right seat [kg]	Ballast right seat [lb]
50 ÷ 60 kg	12 kg	26 lb
60 ÷ 80 kg	10 kg	22 lb
80 ÷ 100 kg	8 kg	18 lb

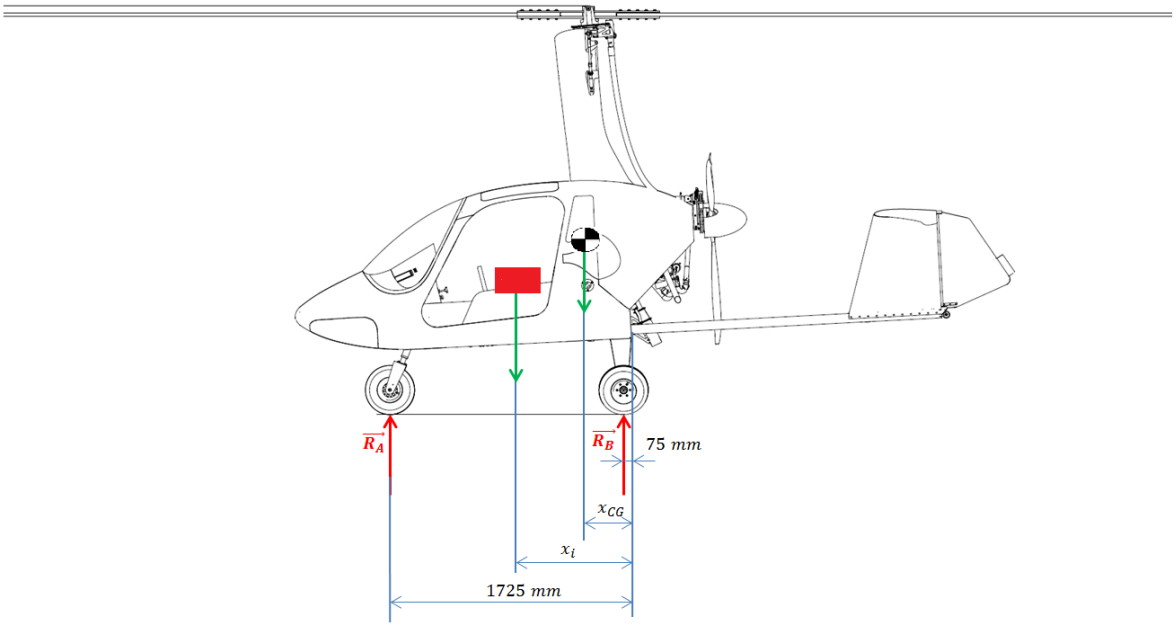
Pilot right seat weight [kg]	Ballast left seat [kg]	Ballast left seat [lb]
50 ÷ 60 kg	15 kg	33 lb
60 ÷ 80 kg	13 kg	29 lb
80 ÷ 100 kg	11 kg	24 lb

CAUTION!

Under no circumstances do not exceed the approved maximum take-off weight (MTOW) equal to 560 kg (1235 lb).

6.3 Position of the Centre of Gravity

The position of the centre of gravity of the gyrocopter (a sideways view) is specified through the value of the angle whose apex is located on the transverse axis for rotor head suspension on the mast, one arm is parallel to the vertical axis of the coordinate system related to the fuselage, and the other arm passes through the centre of gravity of the gyrocopter.



The admissible range of the position of the centre of gravity of the **empty gyrocopter** is:

225 +/- 30mm

The actual position of the centre of gravity of the empty gyrocopter for a specific model is included in the up-to-date weighing report and is stated in subsection 6.4 of this manual.

The admissible range of the position of the centre of gravity of the **gyrocopter in flight** is:

350 ÷ 480mm

6.4 Weighing and Specifying the CG Position by a Three-Scales Method

A method of three-scales put under the landing gear wheels is more intelligible for the most of the users. When put on scales, the gyrocopter must be levelled by means of an accurate level held on the upper flat surface of the tunnel inside the cockpit between the seats. The gyrocopter can be weighed both with the rotor fitted and without it. It is essential for the accurate specification of the position of the centre of gravity that the rotor head axis is set up exactly vertical.

The gyrocopter weight is equal to a sum of (net) indications of all the three scales (plus the rotor weight provided it was detached when weighing the gyrocopter).

$$W = W_F + W_{RL} + W_{RR} (+ W_R)$$

The position of the centre of gravity along axis X is calculated from the following formula:

$$x_{cg} = \frac{W_F \times a + (W_{RL} + W_{RR}) \times b}{W_F + W_{RL} + W_{RR}}$$

where:

- W – gyrocopter weight
- W_F – weight indication under the front wheel
- W_{RL} – weight indication under the rear left wheel
- W_{RR} – weight indication under the rear right wheel
- W_R – rotor weight
- $a = 1725$ [mm] – axis coordinate of the front wheel
- $b = 75$ [mm] – axis coordinate of the rear wheels
- x_{cg} [mm] – coordinate of the centre of gravity of the gyrocopter

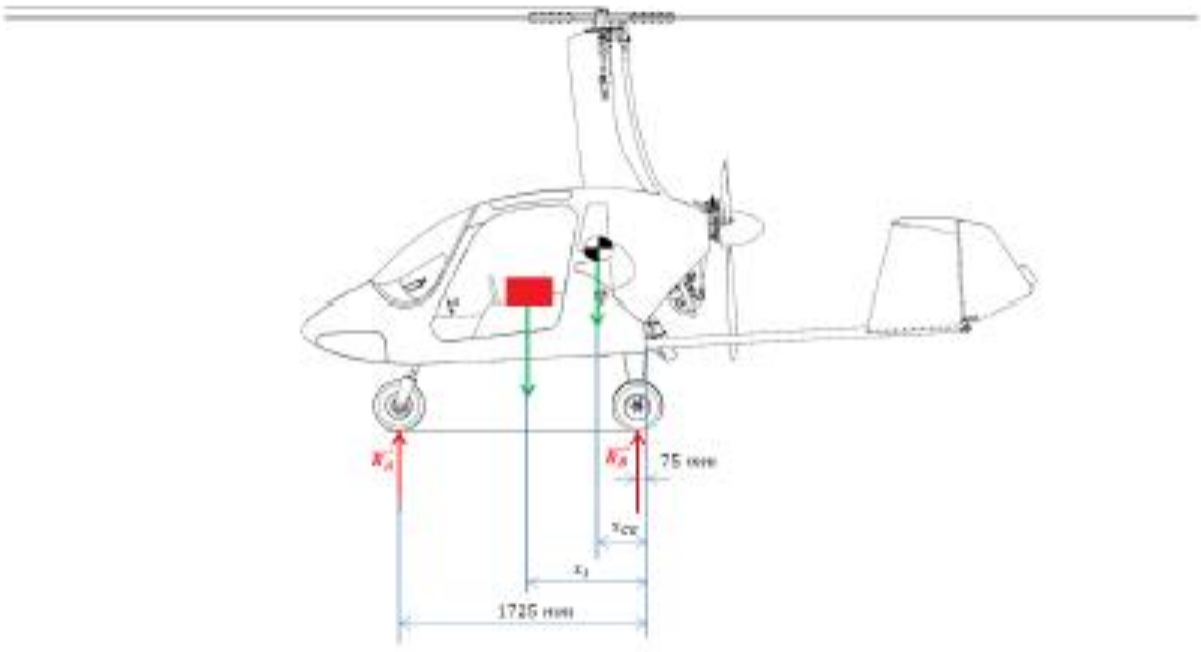
NOTE:

The theoretical values of dimensions **a** and **b** are stated above.

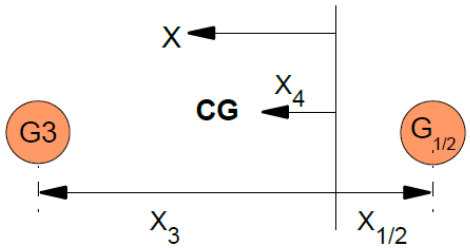
The values must be measured when weighing and inserted into the formula.

The admissible range of the position of the centre of gravity of the empty gyrocopter is:

195 ÷ 255 mm



Example: CG definition



NOTE:

Observing the conditions of the admissible load and the proper position of the centre of gravity of the empty gyrocopter ensures maintenance in the above range of the positions of the centre of gravity.

6.5 Entering the Weight and Position of the Centre of Gravity of the Empty Gyrocopter

The table below serves to enter periodic weighing checks of the gyrocopter or weighing checks after making changing in equipment, repairs or lacquering.

Date	Gyrocopter empty weight [kg]	Position of centre of gravity [degrees]	Approved by: Signature

Chapter 7 Description of the Gyrocopter and its Equipment

7.1 Introduction

Chapter 7 includes the description and manner of operating the gyrocopter, its systems and equipment. The details about the optional systems and equipment are included in Chapter 9.

7.2 Airframe

The main structural component of the gyrocopter is the composite fuselage. It is made of carbon fibre saturated with vinylester resin with a coremat applied as the core of separator structures. Horizontal stabilizer (with symmetric airfoil section) is mounted on vertical tail (consisting of stabilizer and rudder). Empennage is attached to two pipes, made of carbon fibre, guided from the fuselage. An aluminum mast is affixed to the fuselage structure, on which the control head with the lifting rotor is mounted.

The two-blade rotor with aluminum structure is manufactured and delivered in a set (blades + a hub) by the AVIATION ARTUR TRENDAK Company. The blades with a 8H12 airfoil section are made from drawn aluminium and are entirely anodized and perfectly balanced.

7.3 Flight controls

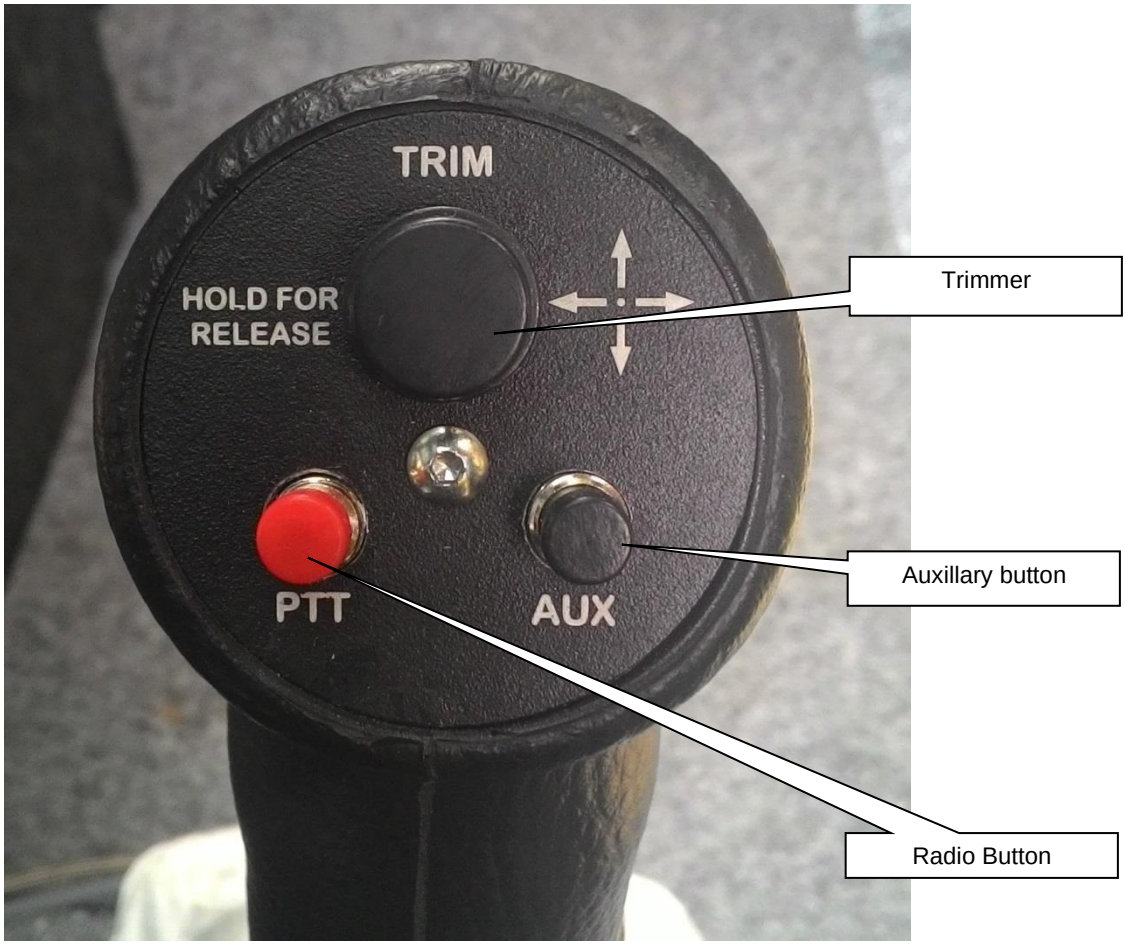
Controlling flight is performed by using the control stick and pedals. Each of crew members have his own flight control set. The movements of the control stick are transmitted by the flexible Bowden cables kinematic system to the rotor head. The movements of the pedals are transmitted to the rudders by the flexible Bowden cables.

When the pilot moves the stick forwards, the rotor head tilt forwards and the gyrocopter pitch down. When moves the stick backwards, the head tilt backwards and causes the nose pitch up. When the pilot moves stick completely forwards (in practice it is impossible in flight), the rotor head disc rests on the fixed frictional component (bent from stainless steel) and brakes the rotor.

When the pilot moves the stick to the left, the head tilt to the left and bank the gyrocopter left. Analogously when pilot moves the stick to the right, the head tilt to the right and bank the gyrocopter right.

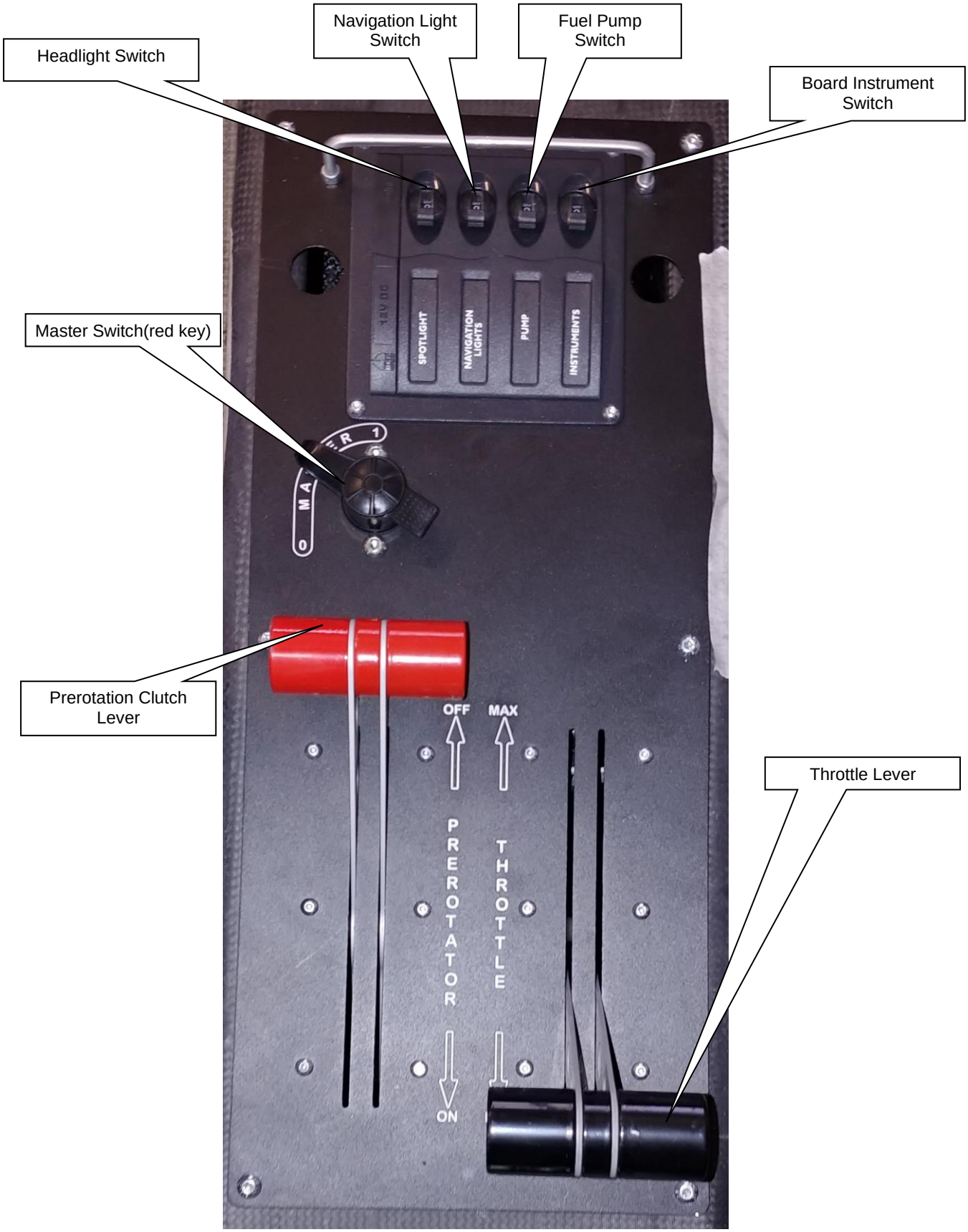
When the pilot pushes the left pedal, the rudder deflects left. Pushing the right pedal causes the rudder to deflect right. Deflecting the rudder right pushes the tail left and causes the nose to yaw to the right.

The gyrocopter is equipped with an electrical balancing device (trimmer). This device reduces the effort required to adjust or maintain a desired flight attitude. Electrical trimming is implemented by means of electrical actuators installed in control system. By clicking appropriate trimmer, corresponded with it actuator will move and change the neutral position of Control Stick. Trimmer release button changes position of actuators towards neutral position. This will reduce all forces generated by trimmers on control stick to 0. In order to release trimmers pilot has to push the Trimmer Release Button and hold it longer than one second. After that actuators will move to neutral position. Trimmer actuator position is represented in cockpit by proper indicators. The figure below presents control stick grip.



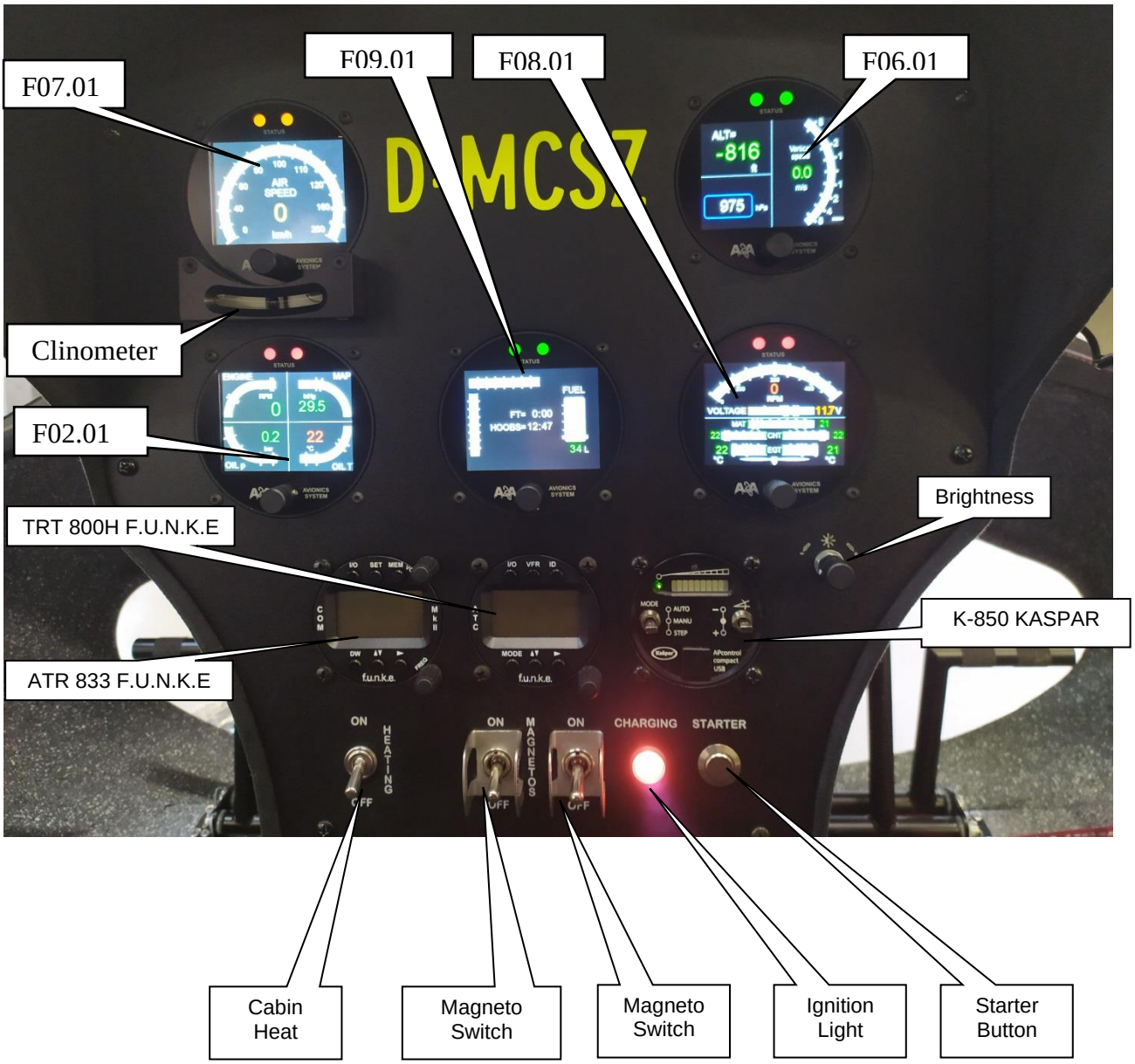
On the rudder there is a relieving flap, which aims at facilitating flight straight ahead without the necessity for the pilot to use the pedals. It is installed by the manufacturer after the phase of test flights. If needed, flap position can be corrected, by gently bending it in or out (see Aircraft Maintenance Manual).

7.4 Central Console



7.5 Instrument Panel

An instrument panel is presented below. Different panel configuration and set of flight and navigation instruments is possible. The details concerning other variants are stated in Chapter 9 “Supplements”.



7.5.1 *Display EEM MOT 01 F02.01*

Rev. 01 – May 2017

7.5.1.1. *Introduction*

This instrument is intended for ultralight, microlight, homebuilt and experimental aircraft. The purpose of EEM MOT 01 type display is to present key engine status information to the pilot. Version F02.01 displays engine speed, inlet air pressure, oil pressure and temperature.
The device is equipped with an in-built colour display protected by anti-reflective coated glass. The encoder knob & push-button located in the front provides user interaction with the device. The electric connector, hardware and software identification plates are located in the back of the casing (Fig. 1)

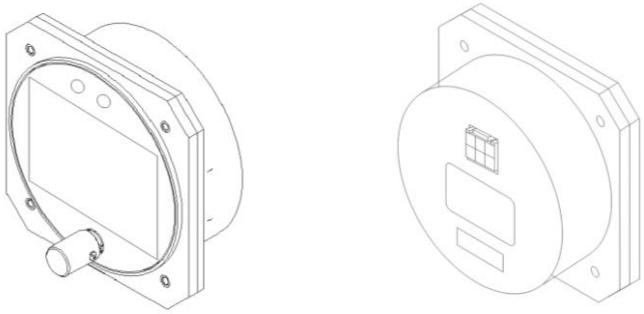


Fig. 1. EEM MOT 01 Display

7.5.1.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.

Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user. Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.

Operation of this instrument is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.

This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the instrument lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.1.3. Handling in transport and storage

The EEM MOT 01 monitor is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.1.4. Installation

7.5.1.4.1. Environmental specifications

The EEM MOT 01 display has been designed to be installed in non-hermetic cockpits of ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). Acceptable range of operating parameters is listed below:

Operating temperature:	-20 ºC ÷ 50 ºC
Short-term operating temperature:	-25 ºC ÷ 60 ºC
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.1.4.2. Dimensions

Outline dimensions of the display are: 85 x 85 x 67 mm (*width x height x depth*), Weight: 175 g.

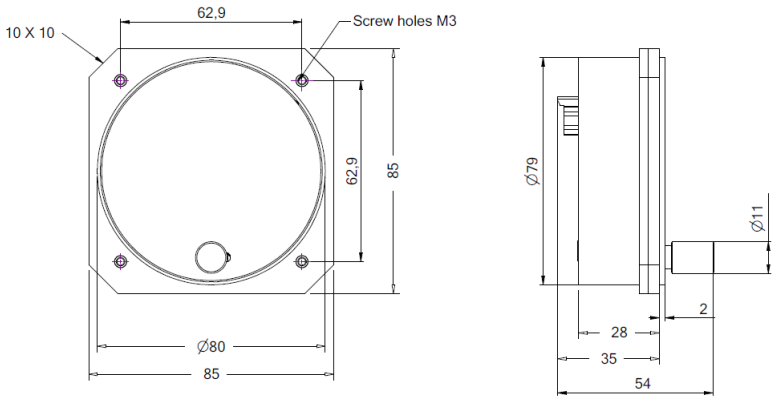


Fig. 2. EEM MOT 01 Display outline drawing

7.5.1.4.3. Mounting

The display should be located conveniently within the pilot's view in the control panel in the cockpit. The diameter of the mounting hole to be cut in the panel is 80mm. It is recommended that the display is installed from the rear side the control panel. The display is to be fastened to the panel by means of four M3 screws that are located symmetrically to the centre of the mounting hole in the spacing of 62.9 mm (Fig. 3).

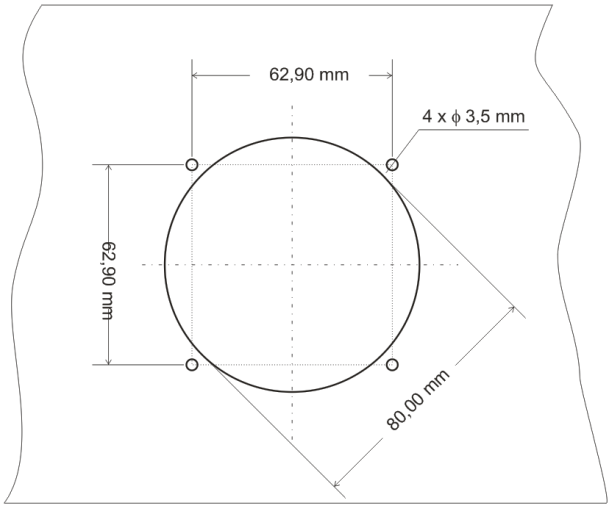


Fig. 3. Mounting hole and screw holes measurements (not to scale)

7.5.1.4.4. Power and wiring

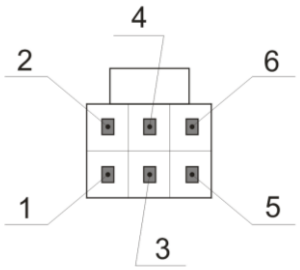
The EEM MOT 01 display is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 85mA.

The EEM MOT 01 display is connected to the system by in-built MOLEX Ultra-Fit 3.5 mm 6 pin male connector located at the back of the instrument. A schematic diagram of the connection is shown in Figure 4 and in Table 1.

The power supply (pins no. 5 and 6) requires 0.5 mm^2 wires.

Data bus (pins no. 3 and 4) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814 (Fig. 4). Twisting should continue to the pins of the connector.
Pins 1 and 2 are to be left unconnected.

Tab. 1. Connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	RS A	
4	RS B	
5	GND	
6	+12 V	

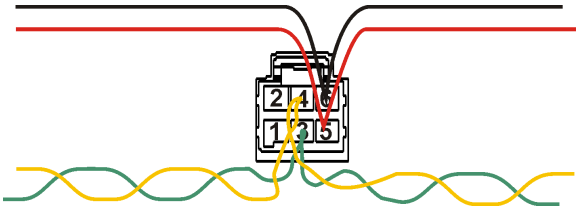
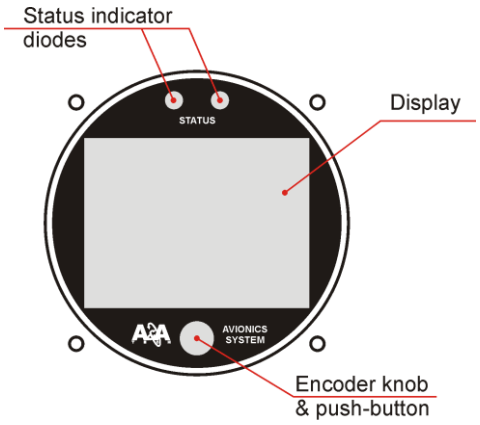


Fig. 4. Wire twisting and connection

Operation and maintenance of EEM MOT 01 F02.01 display

The display is to be connected to EMS DAQ R2.

The front panel of EEM MOT 01 is composed of three elements: the display, two status diodes (alert indication), and the encoder knob & push-button for setting parameters (Fig. 5).



Rys. 5. Front panel of EEM MOT 01 Display

The EEM MOT 01 display displays values of flight parameters that are either directly measured or calculated by the system. The display starts automatically as the power is turned on. As shown in Figure 6, the monitor with F02.01 software version presents:

Engine speed – in the upper left quarter of the display;

Inlet air pressure (manifold or boost pressure) – in the upper right quarter of the display;

Oil pressure – in the bottom left quarter of the display;
Oil temperature – in the bottom right quarter of the display.

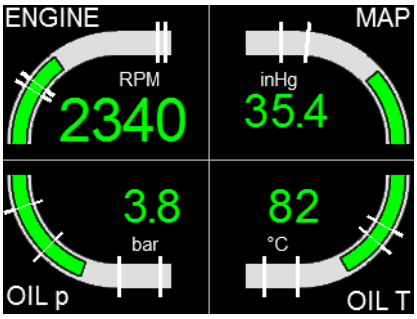


Fig. 6. Display of the F02.01 software version

On client's request, warning and alarm threshold values may be set for some of the above parameters according to the specification provided by the aircraft supplier. Default threshold values are listed in Table 2.

Lp.	Parameter	Symbol/ name in display	Unit	Range of bar graph indicator	Warning/alarm thresholds	
					Warning	Alarm
1	Engine speed	ENGINE	RPM	0 – 6000 rpm	from 1400 to 1600 rpm* from 5500 to 5800 rpm	under 1400 rpm* above 5800 rpm
2	Inlet air pressure	MAP	inHg	28 – 50 inHg	from 43 to 46 inHg	above 46 inHg
3	Oil pressure	OIL p	Bar	0 – 7,5 bar	from 1,0 to 2,5 bar# from 5,0 to 7,0 bar	under 1,0 bar# above 7 bar
4	Oil temperature	OIL T	°C	0 – 140 °C	from 50 to 60°C from 110 to 130°C	under 50°C above 130°C

*Alerts marked with the asterisk * are activated when the system detects that the engine has been started, so from the moment of the engine speed exceeding 1600 RPM. Alarms marked with the hash symbol # are activated if the engine speed is above 800 RPM.*
Tab. 2. Parameters displayed by EEM MOT 01 F02.01 display

As the aircraft operates within "normal" range of the parameter in question, the instrument displays values in green, and status diodes are green. If the threshold level is being exceeded, the instrument informs the pilot by changing both the colour of displayed figures and the colour of status diodes. Exceeding the alarm threshold is additionally indicated by the diodes flashing red. The pilot can switch off flashing by pushing the encoder knob. Figure 7 presents the idea of colour codes and warning/alarm indication.

Thus, information on the status of a flight parameter is presented in two ways:
by means of the colour of two status diodes according to the following colour code:

green – engine parameters within normal range;
orange – warning;
red – alarm;

by means of the colour of digits and bar graph (if applicable) presenting the value of the parameter:

green – engine parameters within normal range;

orange – warning;

red – alarm;

The status information is obtained as a result of analysis conducted by the instrument on the basis of digital input transmitted by the measurement modules of the system.
Both diodes are always of the same colour corresponding to the status of the parameter that assumes “the worst” value.

Fig. 7. The idea of flight parameter status information

7.5.1.5. Service, diagnostics and repairs

7.5.1.5.1. Service life

TBO of the display is not defined.

In the case of failure or error, the display must not be used any more.

7.5.1.5.2. Checks

The following checks are recommended:

At pre-flight check:
Turn on the power to check if operational;

After 100 hours of flight:
Check the instrument’s electric connections;
Turn on the power on to check if operational.

7.5.1.5.3. Cleaning and conservation

The screen is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution or with a liquid dedicated for liquid crystal displays. Caution: the surface is vulnerable to scratching.

7.5.1.5.4. Troubleshooting

If the screen stays blank when power is applied, turn off power supply and verify power connection. Ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

If no information is displayed when power is applied (Fig. 8), check connection to measurement modules.

Fig. 8. Indication of no connection to measurement modules

In the case of the instrument's failure or malfunction, turn power off and on again.

If the above does not solve the problem, the display needs to be replaced.

A defective instrument must not be used.

7.5.1.5.5. Repairs

Repairs and inspections of the instrument can be conducted only by its manufacturer.
The display does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.
If the monitor fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

7.5.1.5.6. Re-programming

Modifications to the instrument's settings that are not possible to be conducted by means of the encoder can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.1.5.7. Spare parts

The instrument does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.2 *Display EEM MOT 01 F06.01*

Rev. 01 – May 2017

7.5.2.1. Introduction

This instrument is intended for ultralight, microlight, homebuilt and experimental aircraft. The purpose of EEM MOT 01 type display is to present key flight information to the pilot. Version F06.01 displays altitude and vertical speed of the aircraft.
The device is equipped with an in-built colour display protected by anti-reflective coated glass. The encoder knob & push-button located in the front provides user interaction with the device. The electric connector, hardware and software identification plates are located in the back of the casing (Fig. 1)

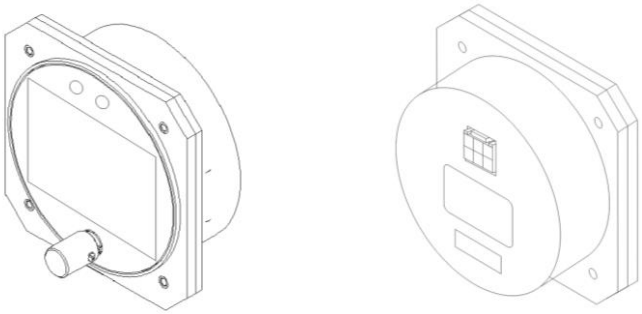


Fig. 9. EEM MOT 01 Display

7.5.2.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.

Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user. Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.

Operation of this instrument is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.

This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the instrument lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.2.3. Handling in transport and storage

The EEM MOT 01 monitor is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.2.4. Installation

7.5.2.4.1. Environmental specifications

The EEM MOT 01 display has been designed to be installed in non-hermetic cockpits of ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). Acceptable range of operating parameters is listed below:

Operating temperature:	-20 ^{o}C ÷ 50 ^{o}C
Short-term operating temperature:	-25 ^{o}C ÷ 60 ^{o}C
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.2.4.2. Dimensions

Outline dimensions of the display are: 85 x 85 x 67 mm (*width x height x depth*), Weight: 175 g.

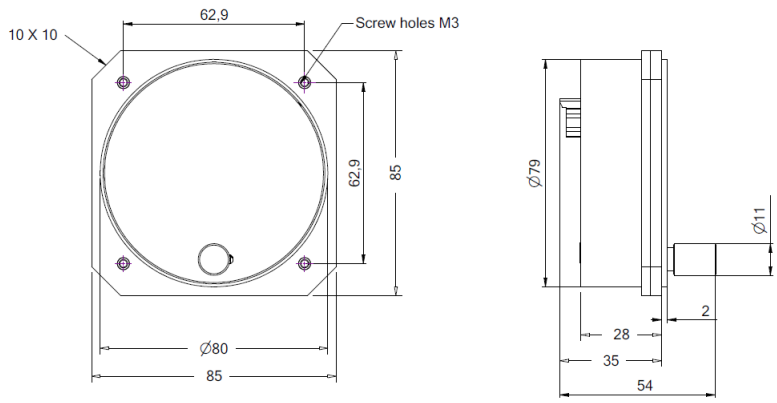


Fig. 10. EEM MOT 01 Display outline drawing

7.5.2.4.3. Mounting

The display should be located conveniently within the pilot's view in the control panel in the cockpit. The diameter of the mounting hole to be cut in the panel is 80mm. It is recommended that the display is installed from the rear side the control panel. The display is to be fastened to the panel by means of four M3 screws that are located symmetrically to the centre of the mounting hole in the spacing of 62.9 mm (Fig. 3).

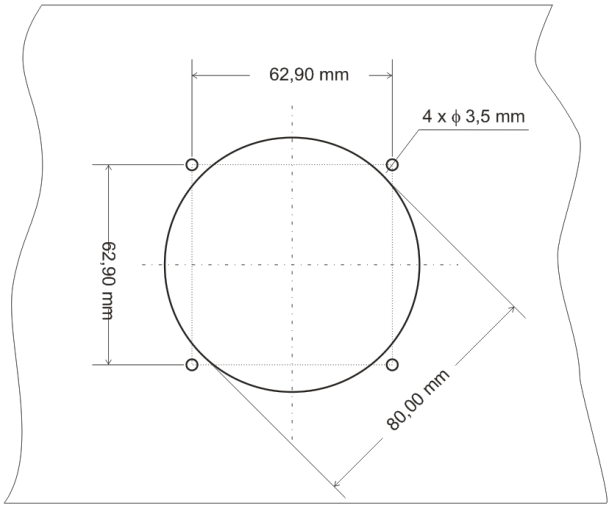


Fig. 11. Mounting hole and screw holes measurements (not to scale)

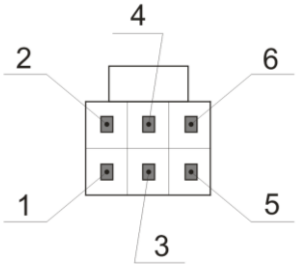
7.5.2.4.4. Power and wiring

The EEM MOT 01 display is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 85mA.

The EEM MOT 01 display is connected to the system by in-built MOLEX Ultra-Fit 3.5 mm 6 pin male connector located at the back of the instrument. A schematic diagram of the connection is shown in Figure 4 and in Table 1.

The power supply (pins no. 5 and 6) requires 0.5 mm^2 wires.
Data bus (pins no. 3 and 4) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814 (Fig. 4). Twisting should continue to the pins of the connector.
Pins 1 and 2 are to be left unconnected.

Tab. 3. Connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	RS A	
4	RS B	
5	GND	
6	+12 V	

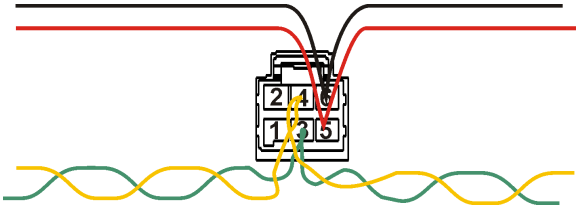


Fig. 12. Wire twisting and connection

7.5.2.5. Operation and maintenance of EEM MOT 01 F06.01 display

The display is to be connected to AUX AVS 2.

The front panel of EEM MOT 01 is composed of three elements: the display, two status diodes (alert indication), and the encoder knob & push-button for setting parameters (Fig. 5).

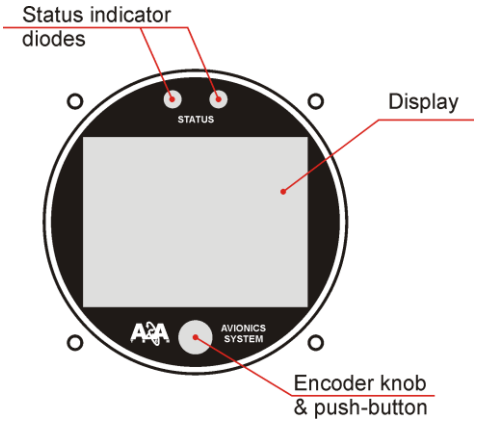


Fig. 13. Front panel of EEM MOT 01 Display

The EEM MOT 01 display displays values of flight parameters that are either directly measured or calculated by the system. The display starts automatically as the power is turned on. As shown in Figure 6, the monitor with F06.01 software version presents:

Altitude – in the upper left quarter of the display;

Vertical speed – on the right side of the display;
Reference pressure – in the bottom left quarter of the display.

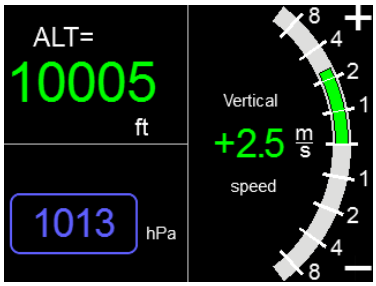


Fig. 14. Display of the F06.01 software version

On client's request, warning and alarm threshold values may be set for some of the above parameters according to the specification provided by the aircraft supplier. Default threshold values are listed in Table 2.

Tab. 4. Parameters displayed by EEM MOT 01 F06.01 display

Lp.	Parameter	Symbol/ name in display	Unit	Range of bar graph indicator	Warning/alarm thresholds	
					Warning	Alarm
1	Altitude	ALT	m	---	---	---
			ft	---	---	---
2	Wariometr	Vertical speed	m/s	± 8	---	---
			ft/min	± 2400	---	---
3	Reference pressure	---	hPa	---	---	---
			mmHg	---	---	---

As the aircraft operates within "normal" range of the parameter in question, the instrument displays values in green, and status diodes are green. If the threshold level is being exceeded, the instrument informs the pilot by changing both the colour of displayed figures and the colour of status diodes. Exceeding the alarm threshold is additionally indicated by the diodes flashing red. The pilot can switch off flashing by pushing the encoder knob. Figure 7 presents the idea of colour codes and warning/alarm indication.

Fig. 15. The idea of flight parameter status information

Thus, information on the status of a flight parameter is presented in two ways:
by means of the colour of two status diodes according to the following colour code:

green – flight parameters within normal range;

orange – warning;

red – alarm;

by means of the colour of digits and bar graph (if applicable) presenting the value of the parameter:

green – flight parameters within normal range;

orange – warning;

red – alarm;

The status information is obtained as a result of analysis conducted by the instrument on the basis of digital input transmitted by the measurement modules of the system.
Both diodes are always of the same colour corresponding to the status of the parameter that assumes "the worst" value.

The reference pressure value is to be set by means of the encoder knob. In 5 seconds from its last modification, the value is considered defined, and the system remembers it as default when turned on next time.

7.5.2.6. Service, diagnostics and repairs

7.5.2.6.1. Service life

TBO of the display is not defined.

In the case of failure or error, the display must not be used any more.

7.5.2.6.2. Checks

The following checks are recommended:

At pre-flight check:
Turn on the power to check if operational;

After 100 hours of flight:
Check the instrument's electric connections;
Turn on the power on to check if operational.

7.5.2.6.3. Cleaning and conservation

The screen is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution or with a liquid dedicated for liquid crystal displays. Caution: the surface is vulnerable to scratching.

7.5.2.6.4. Troubleshooting

If the screen stays blank when power is applied, turn off power supply and verify power connection. Ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

If no information is displayed when power is applied (Fig. 8), check connection to measurement modules.

Fig. 16. Indication of no connection to measurement modules

In the case of the instrument's failure or malfunction, turn power off and on again.

If the above does not solve the problem, the display needs to be replaced.

A defective instrument must not be used.

7.5.2.6.5. Repairs

Repairs and inspections of the instrument can be conducted only by its manufacturer.
The display does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.
If the monitor fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

7.5.2.6.6. Re-programming

Modifications to the instrument's settings that are not possible to be conducted by means of the encoder can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.2.6.7. Spare parts

The instrument does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.3 *Display EEM MOT 01 F07.01*

Rev. 01 – May 2017

7.5.3.1. *Introduction*

This instrument is intended for ultralight, microlight, homebuilt and experimental aircraft. The purpose of EEM MOT 01 type display is to present key flight information to the pilot. Version F07.01 displays air speed of the aircraft.
The device is equipped with an in-built colour display protected by anti-reflective coated glass. The encoder knob & push-button located in the front provides user interaction with the device. The electric connector, hardware and software identification plates are located in the back of the casing (Fig. 1)

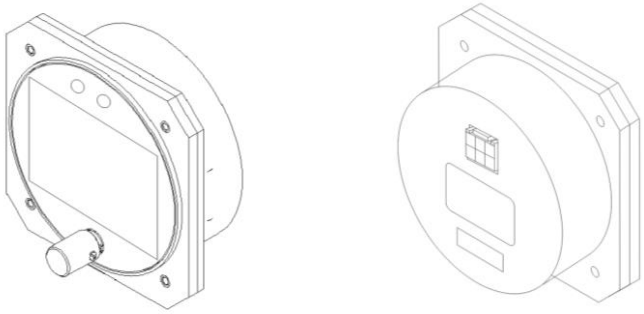


Fig. 17. EEM MOT 01 Display

7.5.3.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.
Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user.

Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.
Operation of this instrument is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.
This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the instrument lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.3.3. Handling in transport and storage

The EEM MOT 01 monitor is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.3.4. Installation

7.5.3.4.1. Environmental specifications

The EEM MOT 01 display has been designed to be installed in non-hermetic cockpits of ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). Acceptable range of operating parameters is listed below:

Operating temperature:	-20 ^{o}C ÷ 50 ^{o}C
Short-term operating temperature:	-25 ^{o}C ÷ 60 ^{o}C
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.3.4.2. Dimensions

Outline dimensions of the display are: 85 x 85 x 67 mm (*width x height x depth*), Weight: 175 g.

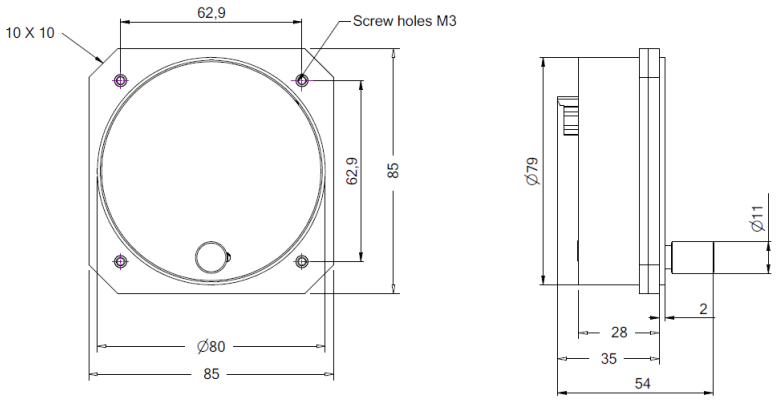


Fig. 18. EEM MOT 01 Display outline drawing

7.5.3.4.3. Mounting

The display should be located conveniently within the pilot's view in the control panel in the cockpit. The diameter of the mounting hole to be cut in the panel is 80mm. It is recommended that the display is installed from the rear side the control panel. The display is to be fastened to the panel by means of four M3 screws that are located symmetrically to the centre of the mounting hole in the spacing of 62.9 mm (Fig. 3).

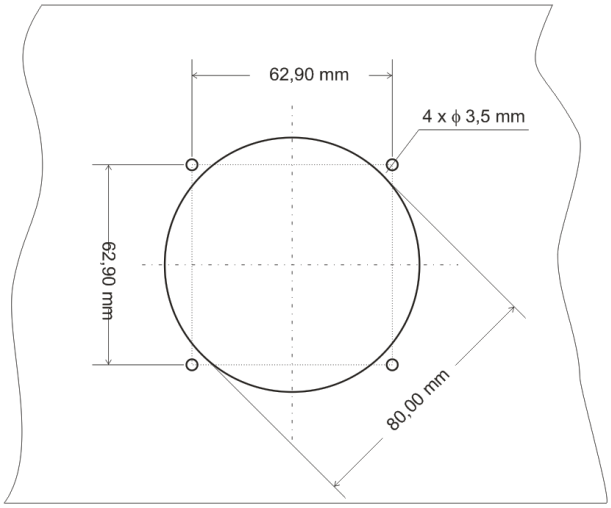


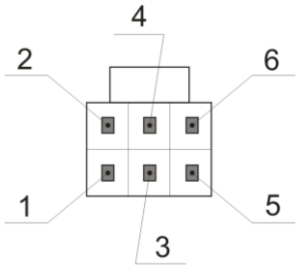
Fig. 19. Mounting hole and screw holes measurements (not to scale)

7.5.3.4.4. Power and wiring

The EEM MOT 01 display is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 85mA.

The EEM MOT 01 display is connected to the system by in-built MOLEX Ultra-Fit 3.5 mm 6 pin male connector located at the back of the instrument. A schematic diagram of the connection is shown in Figure 4 and in Table 1.
The power supply (pins no. 5 and 6) requires 0.5 mm^2 wires.
Data bus (pins no. 3 and 4) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814 (Fig. 4). Twisting should continue to the pins of the connector.
Pins 1 and 2 are to be left unconnected.

Tab. 5. Connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	RS A	
4	RS B	
5	GND	
6	+12 V	

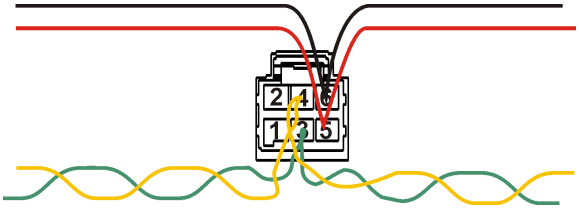


Fig. 20. Wire twisting and connection

7.5.3.5. Operation and maintenance of EEM MOT 01 F07.01 display

The display is to be connected to AUX AVS 2.

The front panel of EEM MOT 01 is composed of three elements: the display, two status diodes (alert indication), and the encoder knob & push-button for setting parameters (Fig. 5).

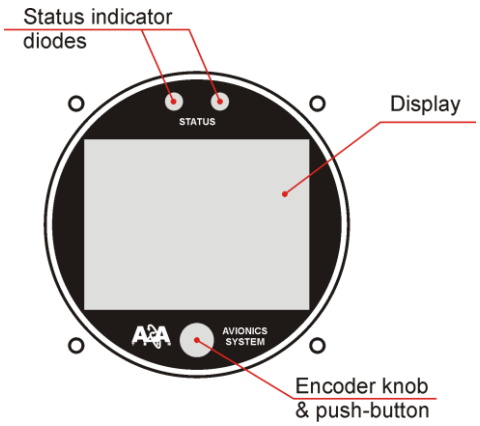


Fig. 21. Front panel of EEM MOT 01 Display

The EEM MOT 01 display displays values of flight parameters that are either directly measured or calculated by the system. The display starts automatically as the power is turned on.
As shown in Figure 6, the monitor with F07.01 software version presents:

Air speed of the aircraft.

Fig. 22. Display of the F06.01 software version

On client's request, warning and alarm threshold values may be set for some of the above parameters according to the specification provided by the aircraft supplier. Default threshold values are listed in Table 2.

Tab. 6. Parameters displayed by EEM MOT 01 F06.01 display

Lp.	Parameter	Symbol/ name in display	Unit	Range of bar graph indicator	Warning/alarm thresholds	
					Warning	Alarm
1	Air speed of the aircraft	AIR SPEED	km/h	0 – 200 km/h	under 60 km/h from 160 to 180 km/h	above 180 km/h

As the aircraft operates within "normal" range of the parameter in question, the instrument displays values in green, and status diodes are green. If the threshold level is being exceeded, the instrument informs the pilot by changing both the colour of displayed figures and the colour of status diodes. Exceeding the alarm threshold is additionally indicated by the diodes flashing red. The pilot can switch off flashing by pushing the encoder knob. Figure 7 presents the idea of colour codes and warning/alarm indication.

Fig. 23. The idea of flight parameter status information

Thus, information on the status of a flight parameter is presented in two ways:

by means of the colour of two status diodes according to the following colour code:

green – flight parameters within normal range;

orange – warning;

red – alarm;

by means of the colour of digits and bar graph (if applicable) presenting the value of the parameter:

green – flight parameters within normal range;

orange – warning;

red – alarm;

The status information is obtained as a result of analysis conducted by the instrument on the basis of digital input transmitted by the measurement modules of the system.

Both diodes are always of the same colour corresponding to the status of the parameter that assumes "the worst" value.

7.5.3.6. Service, diagnostics and repairs

7.5.3.6.1. Service life

TBO of the display is not defined.

In the case of failure or error, the display must not be used any more.

7.5.3.6.2. Checks

The following checks are recommended:

At pre-flight check:

Turn on the power to check if operational;

After 100 hours of flight:

Check the instrument's electric connections;

Turn on the power on to check if operational.

7.5.3.6.3. Cleaning and conservation

The screen is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution or with a liquid dedicated for liquid crystal displays. Caution: the surface is vulnerable to scratching.

7.5.3.6.4. Troubleshooting

a) If the screen stays blank when power is applied, turn off power supply and verify power connection. Ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

b) If no information is displayed when power is applied (Fig. 8), check connection to measurement modules.

Fig. 24. Indication of no connection to measurement modules

c) In the case of the instrument's failure or malfunction, turn power off and on again.

d) If the above does not solve the problem, the display needs to be replaced.

e) A defective instrument must not be used.

7.5.3.6.5. Repairs

Repairs and inspections of the instrument can be conducted only by its manufacturer.
The display does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.
If the monitor fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

7.5.3.6.6. Re-programming

Modifications to the instrument's settings that are not possible to be conducted by means of the encoder can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.3.6.7. Spare parts

The instrument does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.4 *Display EEM MOT 01 F08.01*

Rev. 01 – May 2017

7.5.4.1. *Introduction*

This instrument is intended for ultralight, microlight, homebuilt and experimental aircraft. The purpose of EEM MOT 01 type display is to present key engine status information to the pilot. Version F08.01 displays rotor speed, voltage, inlet air temperature, cylinder heads temperature and exhaust gases temperatures.
The device is equipped with an in-built colour display protected by anti-reflective coated glass. The encoder knob & push-button located in the front provides user interaction with the device. The electric connector, hardware and software identification plates are located in the back of the casing (Fig. 1)

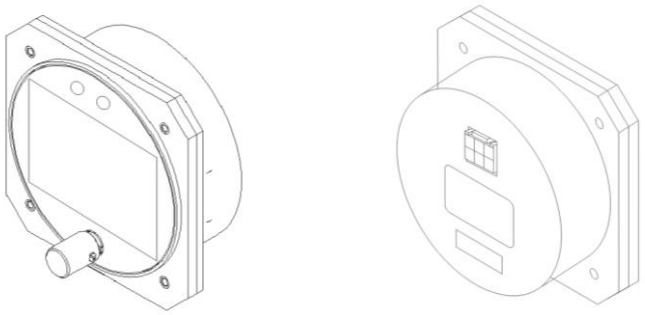


Fig. 25. EEM MOT 01 Display

7.5.4.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its

operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.
Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user. Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.
Operation of this instrument is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.
This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the instrument lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.4.3. Handling in transport and storage

The EEM MOT 01 monitor is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.4.4. Installation

7.5.4.4.1. Environmental specifications

The EEM MOT 01 display has been designed to be installed in non-hermetic cockpits of ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). Acceptable range of operating parameters is listed below:

Operating temperature:	-20 ºC ÷ 50 ºC
Short-term operating temperature:	-25 ºC ÷ 60 ºC
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.4.4.2. Dimensions

Outline dimensions of the display are: 85 x 85 x 67 mm (*width x height x depth*), Weight: 175 g.

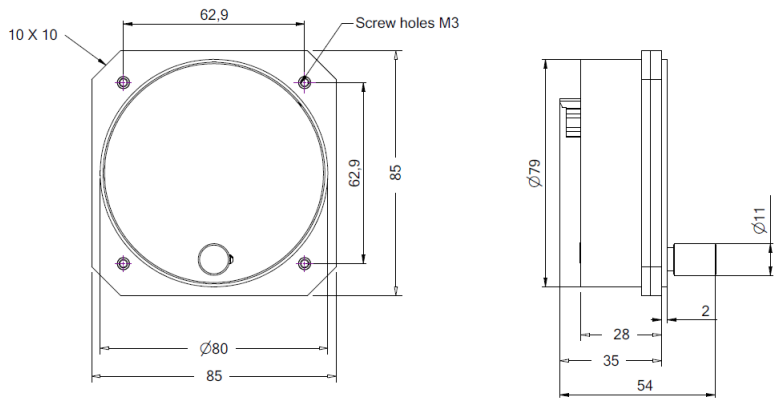


Fig. 26. EEM MOT 01 Display outline drawing

7.5.4.4.3. Mounting

The display should be located conveniently within the pilot's view in the control panel in the cockpit. The diameter of the mounting hole to be cut in the panel is 80mm. It is recommended that the display is installed from the rear side the control panel. The display is to be fastened to the panel by means of four M3 screws that are located symmetrically to the centre of the mounting hole in the spacing of 62.9 mm (Fig. 3).

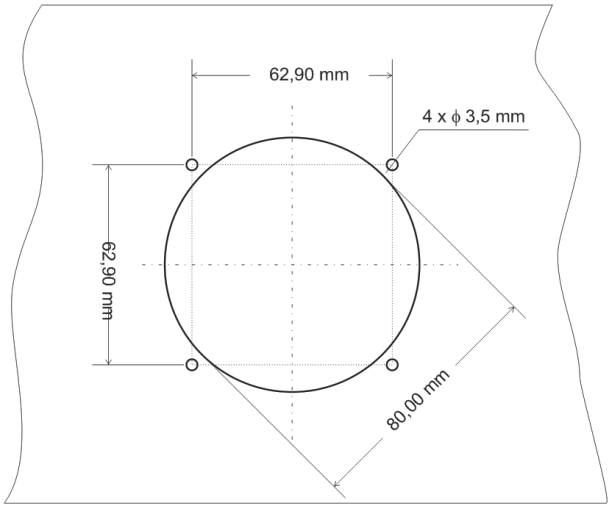


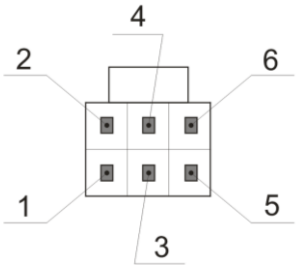
Fig. 27. Mounting hole and screw holes measurements (not to scale)

7.5.4.4.4. Power and wiring

The EEM MOT 01 display is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 85mA.

The EEM MOT 01 display is connected to the system by in-built MOLEX Ultra-Fit 3.5 mm 6 pin male connector located at the back of the instrument. A schematic diagram of the connection is shown in Figure 4 and in Table 1.
The power supply (pins no. 5 and 6) requires 0.5 mm^2 wires.
Data bus (pins no. 3 and 4) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814 (Fig. 4). Twisting should continue to the pins of the connector.
Pins 1 and 2 are to be left unconnected.

Tab. 7. Connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	RS A	
4	RS B	
5	GND	
6	+12 V	

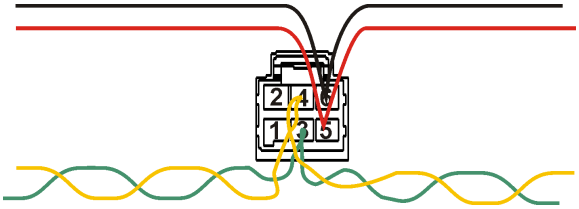
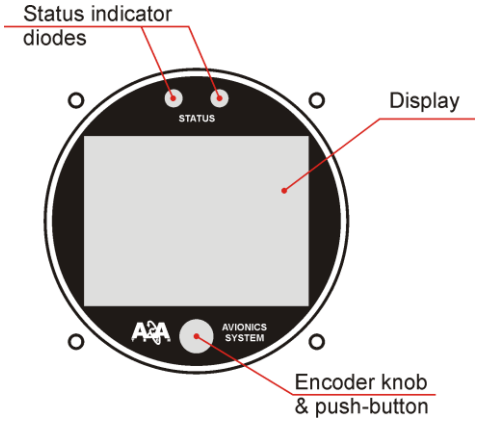


Fig. 28. Wire twisting and connection

7.5.4.5. Operation and maintenance of EEM MOT 01 F08.01 display

The display is to be connected to EMS DAQ R2.

The front panel of EEM MOT 01 is composed of three elements: the display, two status diodes (alert indication), and the encoder knob & push-button for setting parameters (Fig. 5).



Rys. 29. Front panel of EEM MOT 01 Display

The EEM MOT 01 display displays values of flight parameters that are either directly measured or calculated by the system. The display starts automatically as the power is turned on.

As shown in Figure 6, the monitor with F08.01 software version presents:

Rotor speed – in the upper part of the display;

Voltage – directly below the rotor speed indicator;

Inlet air temperature (manifold or ambient temperature) – in the middle of the display;

Cylinder head temperature – in the middle of the display; its right bar graph shows the temperature of the right side of the cylinder head, and the left bar graph – the temperature on the left of cylinder head;

Exhaust gas temperature – in the bottom of the display; its right bar graph shows the temperature measured of the right side of the engine, and the left bar graph – the temperature on the left;

Fig. 30. Display of the F08.01 software version

On client's request, warning and alarm threshold values may be set for some of the above parameters according to the specification provided by the aircraft supplier. Default threshold values are listed in Table 2.

As the aircraft operates within "normal" range of the parameter in question, the instrument displays values in green, and status diodes are green. If the threshold level is being exceeded, the instrument informs the pilot by changing both the colour of displayed figures and the colour of status diodes. Exceeding the alarm threshold is additionally indicated by the diodes flashing red. The pilot can switch off flashing by pushing the encoder knob. Figure 7 presents the idea of colour codes and warning/alarm indication.

Tab. 8. Parameters displayed by EEM MOT 01 F08.01 display

Lp.	Parameter	Symbol/ name in display	Unit	Range of bar graph indicator	Warning/alarm thresholds	
					Warning	Alarm
1	Rotor speed	ROTOR SPEED	RPM	0 – 600 rpm	from 150 to 200 rpm from 400 to 450 rpm	under 150 rpm above 450 rpm
2	Voltage in electric power instalation	VOLTAGE	V	0 – 20 V	from 11 to 12V from 14 to 15V	under 11V above 15V
3	Inlet air temperature	MAT	°C	from -5 to 70°C	from 0 to 5°C from 50 to 60°C	under 0°C above 60°C
4	Cylinder head temperature	CHT	°C	0 – 120°C	from 100 to 110°C	above 110°C
5	Exhaust gas temperature	EGT	°C	0 – 900°C	under 500°C # from 850 to 900°C	above 900°C

Alerts marked with the hash symbol # are activated only if the engine speed exceeds 800 RPM.

Thus, information on the status of a flight parameter is presented in two ways:

by means of the colour of two status diodes according to the following colour code:

green – engine parameters within normal range;

orange – warning;

red – alarm;

by means of the colour of digits and bar graph (if applicable) presenting the value of the parameter:

green – engine parameters within normal range;

orange – warning;

red – alarm;

The status information is obtained as a result of analysis conducted by the instrument on the basis of digital input transmitted by the measurement modules of the system.
Both diodes are always of the same colour corresponding to the status of the parameter that assumes "the worst" value.

Fig. 31. The idea of flight parameter status information

7.5.4.6. Service, diagnostics and repairs

7.5.4.6.1. Service life

TBO of the display is not defined.

In the case of failure or error, the display must not be used any more.

7.5.4.6.2. Checks

The following checks are recommended:

At pre-flight check:
Turn on the power to check if operational;

After 100 hours of flight:
Check the instrument's electric connections;
Turn on the power on to check if operational.

7.5.4.6.3. Cleaning and conservation

The screen is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution or with a liquid dedicated for liquid crystal displays. Caution: the surface is vulnerable to scratching.

7.5.4.6.4. Troubleshooting

If the screen stays blank when power is applied, turn off power supply and verify power connection. Ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

If no information is displayed when power is applied (Fig. 8), check connection to measurement modules.

Fig. 32. Indication of no connection to measurement modules

In the case of the instrument's failure or malfunction, turn power off and on again.

If the above does not solve the problem, the display needs to be replaced.

A defective instrument must not be used.

7.5.4.6.5. Repairs

Repairs and inspections of the instrument can be conducted only by its manufacturer.
The display does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.
If the monitor fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

7.5.4.6.6. Re-programming

Modifications to the instrument's settings that are not possible to be conducted by means of the encoder can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.4.6.7. Spare parts

The instrument does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.5 *Display EEM MOT 01 F09.01*

Rev. 01 – May 2017

7.5.5.1. *Introduction*

This instrument is intended for ultralight, microlight, homebuilt and experimental aircraft. The purpose of EEM MOT 01 type display is to present key engine status information to the pilot. Version F09.01 displays fuel level, pitch and roll trim position, flight time and hoobs.
The device is equipped with an in-built colour display protected by anti-reflective coated glass. The encoder knob & push-button located in the front provides user interaction with the device. The electric connector, hardware and software identification plates are located in the back of the casing (Fig. 1)

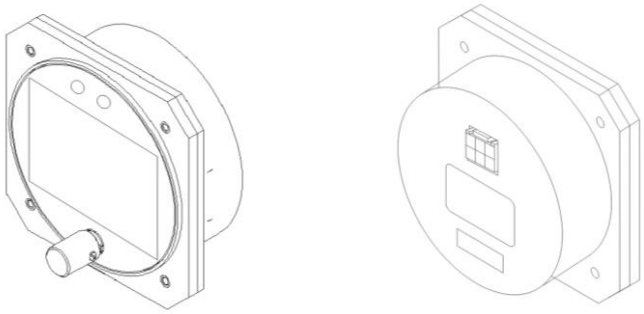


Fig. 33. EEM MOT 01 Display

7.5.5.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.
Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user. Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.

Operation of this instrument is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.
This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the instrument lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.5.3. Handling in transport and storage

The EEM MOT 01 monitor is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.5.4. Installation

7.5.5.4.1. Environmental specifications

The EEM MOT 01 display has been designed to be installed in non-hermetic cockpits of ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). Acceptable range of operating parameters is listed below:

Operating temperature:	-20 °C ÷ 50 °C
Short-term operating temperature:	-25 °C ÷ 60 °C
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.5.4.2. Dimensions

Outline dimensions of the display are: 85 x 85 x 67 mm (*width x height x depth*), Weight: 175 g.

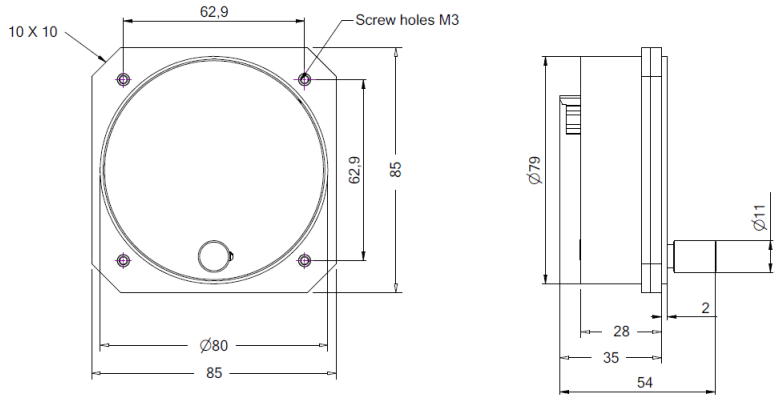


Fig. 34. EEM MOT 01 Display outline drawing

7.5.5.4.3. Mounting

The display should be located conveniently within the pilot's view in the control panel in the cockpit. The diameter of the mounting hole to be cut in the panel is 80mm. It is recommended that the display is installed from the rear side the control panel. The display is to be fastened to the panel by means of four M3 screws that are located symmetrically to the centre of the mounting hole in the spacing of 62.9 mm (Fig. 3).

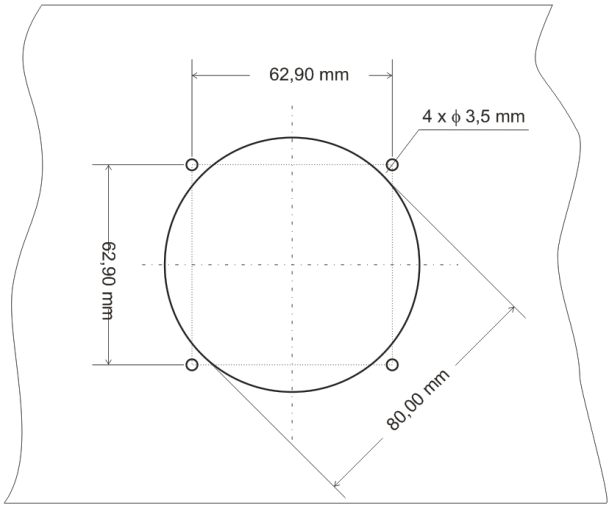


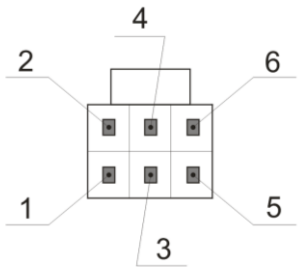
Fig. 35. Mounting hole and screw holes measurements (not to scale)

7.5.5.4.4. Power and wiring

The EEM MOT 01 display is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 85mA.

The EEM MOT 01 display is connected to the system by in-built MOLEX Ultra-Fit 3.5 mm 6 pin male connector located at the back of the instrument. A schematic diagram of the connection is shown in Figure 4 and in Table 1.
The power supply (pins no. 5 and 6) requires 0.5 mm^2 wires.
Data bus (pins no. 3 and 4) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814 (Fig. 4). Twisting should continue to the pins of the connector.
Pins 1 and 2 are to be left unconnected.

Tab. 9. Connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	RS A	
4	RS B	
5	GND	
6	+12 V	

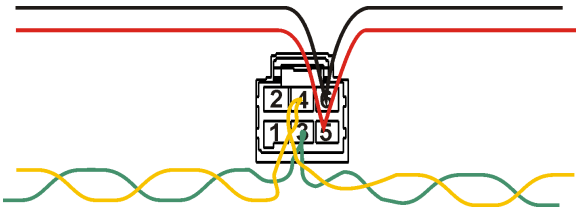
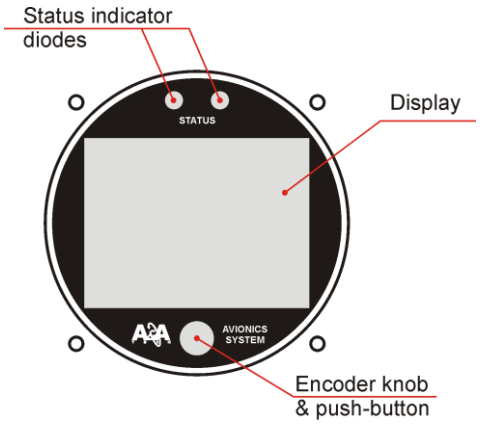


Fig. 36. Wire twisting and connection

7.5.5.5. Operation and maintenance of EEM MOT 01 F09.01 display

The display is to be connected to EMS DAQ R2.

The front panel of EEM MOT 01 is composed of three elements: the display, two status diodes (alert indication), and the encoder knob & push-button for setting parameters (Fig. 5).



Rys. 37. Front panel of EEM MOT 01 Display

The EEM MOT 01 display displays values of flight parameters that are either directly measured or calculated by the system. The display starts automatically as the power is turned on.
As shown in Figure 6, the monitor with F09.01 software version presents:

Pitch trim position – vertical bar graph on the left side of the display;
Roll trim position – horizontal bar graph in the upper left quarter of the display;
Fule level – bar graph on the right;
Flight time (measured from the last start of the engine) – digits in the middle of the display;
Hoobs (total engine running time) - digits in the middle of the display;

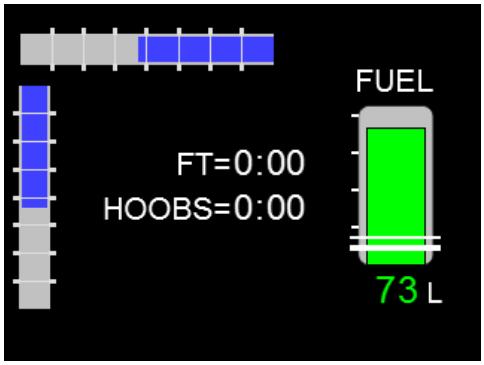


Fig. 38. Display of the F08.01 software version

On client's request, warning and alarm threshold values may be set for some of the above parameters according to the specification provided by the aircraft supplier. Default threshold values are listed in Table 2.

Tab. 10. Parameters displayed by EEM MOT 01 F08.01 display

Lp.	Parameter	Symbol/ name in display	Unit	Range of bar graph indicator	Warning/alarm thresholds	
					Warning	Alarm
1	Fuel level	FUEL	L	0 – 120 l	-------	--------
2	Trim pitch	TRIM	-		-------	--------
3	Trim roll	TRIM	-		-------	--------
4	Flight time	FT	H:min		-------	--------
5	Total engine running time	HOOBS	H:min		-------	--------

As the aircraft operates within "normal" range of the parameter in question, the instrument displays values in green, and status diodes are green. If the threshold level is being exceeded, the instrument informs the pilot by changing both the colour of displayed figures and the colour of status diodes. Exceeding the alarm threshold is additionally indicated by the diodes flashing red. The pilot can switch off flashing by pushing the encoder knob. Figure 7 presents the idea of colour codes and warning/alarm indication.

Fig. 39. The idea of flight parameter status information

Thus, information on the status of a flight parameter is presented in two ways:

1) by means of the colour of two status diodes according to the following colour code:

   green – engine parameters within normal range;

   orange – warning;

   red – alarm;

2) by means of the colour of digits and bar graph (if applicable) presenting the value of the parameter:

   a. green – engine parameters within normal range;

b. orange – warning;

c. red – alarm;

The status information is obtained as a result of analysis conducted by the instrument on the basis of digital input transmitted by the measurement modules of the system.
Both diodes are always of the same colour corresponding to the status of the parameter that assumes "the worst" value.

7.5.5.6. Service, diagnostics and repairs

7.5.5.6.1. Service life

TBO of the display is not defined.

In the case of failure or error, the display must not be used any more.

7.5.5.6.2. Checks

The following checks are recommended:

At pre-flight check:

Turn on the power to check if operational;

After 100 hours of flight:

Check the instrument's electric connections;

Turn on the power on to check if operational.

7.5.5.6.3. Cleaning and conservation

The screen is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution or with a liquid dedicated for liquid crystal displays. Caution: the surface is vulnerable to scratching.

7.5.5.6.4. Troubleshooting

If the screen stays blank when power is applied, turn off power supply and verify power connection. Ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

If no information is displayed when power is applied (Fig. 8), check connection to measurement modules.

Fig. 40. Indication of no connection to measurement modules

In the case of the instrument's failure or malfunction, turn power off and on again.

If the above does not solve the problem, the display needs to be replaced.

A defective instrument must not be used.

7.5.5.6.5. Repairs

Repairs and inspections of the instrument can be conducted only by its manufacturer.
The display does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.
If the monitor fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

7.5.5.6.6. Re-programming

Modifications to the instrument's settings that are not possible to be conducted by means of the encoder can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.5.6.7. Spare parts

The instrument does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.6 *Measuring module AUX AVS 02.01*

Rev. 01 – May 2017

7.5.6.1. *Introduction*

This flight data monitoring module AUX AVS 02.01 is intended for ultralight, microlight, homebuilt and experimental aircraft. This module is not certified by the FAA and EASA. Fitting of this module to a certified aircraft is subject to the rules and conditions pertaining to such in your country. Please check with your local aviation authorities if in doubt.
This flight data monitoring module AUX AVS 02.01 is an element of the Integrated Avionics System that measures the following engine operation parameters:

- Altitude;
- Variometer;
- Air speed;
- Acceleration in 3 axes;

The purpose of AUX AVS 02.01 type measuring module is to collect input. Measured values are communicated to the pilot by means of the following EEM MOT 01 displays: F06.01 and F07.01. Additionally, the module controls the potentiometer that adjusts display brightness of EEM MOT 01 monitors. A change in the potentiometer's settings is measured by the module and digitally transmitted to the monitors and to the EMS DAQ R02.01 measuring module. The type of the potentiometer is R16148-1A-1-B1K.

The module's casing is made of white ABS. The casing is not air-tight to allow cockpit air to the static pressure sensor. To obtain the value of the total pressure, required for defining air speed, the module is to be connected with Pitot tube; a port for this purpose is located in the front-side wall of the module's casing and requires using a pneumatic hose of 4 mm inside diameter.

Hardware identification plates are located in the front of the casing (Fig. 1).

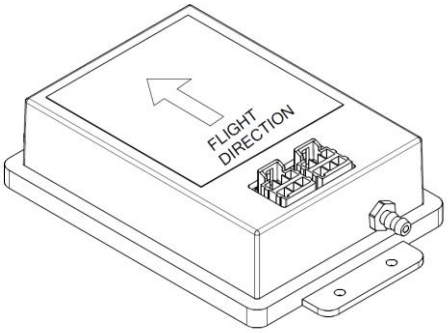


Fig. 41. AUX AVS 02.01 module

7.5.6.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.
Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user. Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.
Operation of this device is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this module and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.
This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the device lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.6.3. Handling in transport and storage

The AUX AVS 02.01 module is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.6.4. Installation

7.5.6.4.1. Environmental specifications

The AUX AVS 02.01 module has been designed to be installed in ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). It should be located inside the cockpit and oriented horizontally in the longitudal axis of the aircraft; the arrow on the casing poins in the direction of the flight. The module's location is to assure easy connection to air hoses.
Acceptable ranges of operating parameters are listed below:

Operating temperature:	-20 ^{o}C ÷ 50 ^{o}C
Short-term operating temperature:	-25 ^{o}C ÷ 60 ^{o}C
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.6.4.2. Dimensions

Outline dimensions of the device are: 74 x 120 x 32 mm (*width x height x depth*), Weight: 85 g.

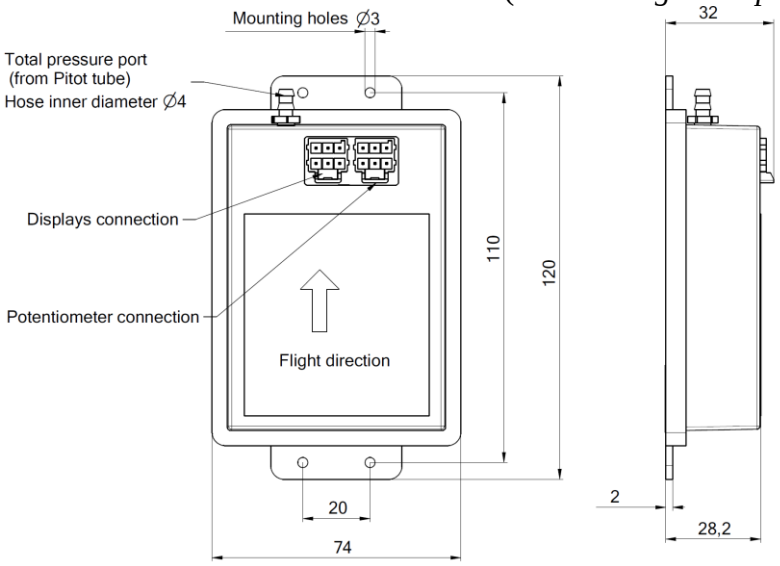


Fig. 42. AUX AVS 02.01 module outline drawing

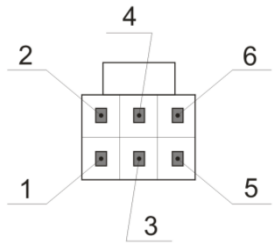
7.5.6.4.3. Mounting

The AUX AVS 02.01 Module should be installed horizontally, along the longitudal axis of the aircraft, with the arrow on the casing facing the direction of flight. Use mounting holes (shown in Figure 2). The module should be located in a part of the cockpit sheltered from splashes of water of other liquids, and far from sources of electromagnetic radiation as possible.
The module is to be connected with Pitot tube to enable measuring air speed. The pitot pressure port is located on the side of the casing that faces flight direction. The pitot pressure hose inside diameter is 4 mm. Static pressure sensor is located inside the module's casing.

7.5.6.4.4. Power and wiring

The AUX AVS 02.01 module is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 12mA.
The AUX AVS 02.01 module is connected to the system by in-built MOLEX Ultra-Fit 3.5 mm 6 pin male connector located at the front of the instrument (left from the direction of flight, see Figure 2).
A schematic diagram of the connection to communication connector (display connector – left) is shown in Figure 3 and in Table 1.
The power supply (pins no. 5 and 6) requires 0.5 mm^2 wires.
Data bus (pins no. 3 and 4) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814 (Fig. 3). Twisting should continue to the pins of the connector.
Pins 1 and 2 are to be left unconnected.

Tab. 11. Display connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	RS A	
4	RS B	
5	GND	
6	+12 V	

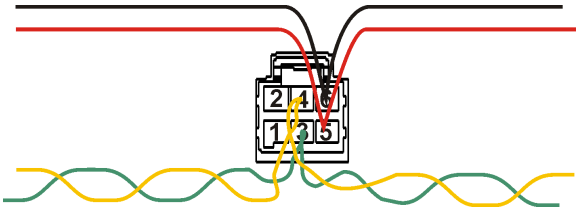
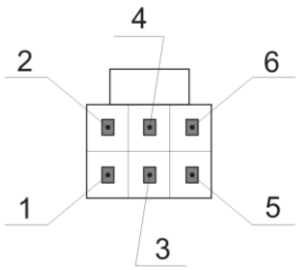


Fig. 43. Wire twisting and connection

A schematic diagram of the connection to potentiometer connector (right connector) is shown in Table 2.
The connection requires 0.5 mm^2 wires.

Tab. 12. Potentiometer connector pin assingment and pin insertion view

Pin number	Function	Connector schematic
1	Reserved (do not connect)	
2	Reserved (do not connect)	
3	Reserved (do not connect)	
4	Power	
5	GND	
6	Signal	

7.5.6.5. Operation and maintenance

The module is to be connected to two EEM MOT 01 displays (F06.01 and F07.01), EMS DAQ R02.01 and diagnostic connector by RS485.

7.5.6.5.1. Measured signals

The type and value range of signals measures by the Module are listed in Table 3.

Tab. 13 Signals processed by AUX AVS 02.01 Module

No.	Parameter	Measurement range	Accuracy
1	Altitude – determined based on the measured static pressure and the reference pressure set up by the pilot	0 ÷ 3000 m	± 8 m
2	Variometer – determined/indications based on changes of the determined altitude	± 12 m/s	± 0.2 m/s
3	Airspeed – determined based on the dynamic pressure measured differentially between the total pressure in the Pitot tube and the static pressure in the pilot's cabin)	25 ÷ 250 km/h	± 5 km/h
4	Acceleration (3 axis)	± 100 m/s^2	± 5 m/s^2
5	Brightness level requirement (signal from potentiometer)	10 ÷ 100 %	± 5 %

7.5.6.6. Service, diagnostics and repairs

7.5.6.6.1. Service life

TBO of the module is not defined.

In the case of failure or error, the module must not be used any more.

7.5.6.6.2. Checks

The following checks are recommended:

At pre-flight check:

Turn on the power to check if operational (the EEM MOT 01 F06.01 and F07.01 monitors should display data);

After 100 hours of flight:

Check the instrument's electric connections;

Turn on the power on to check if operational (check if EEM MOT 01 F06.01 and F07.01 monitors display data);

Change the position of potentiometer and check changes of displays brightness level.

7.5.6.6.3. Cleaning and conservation

The casing is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution. Caution: avoid spilling liquids over the device.

7.5.6.6.4. Troubleshooting

If information is not displayed on some of the monitors (F06.01, F07.01) when power is applied (Fig. 4), check connection inside measurement module. Check:

power connection; ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

data bus connection;

Fig. 44. Indication of no connection to measurement module

If the system does not react to brightness adjustment, check connection with potentiometer;

In the case of the module's failure or malfunction, turn power off and on again.

If the above does not solve the problem, the module needs to be replaced.

A defective module must not be used.

7.5.6.6.5. Repairs

Repairs and inspections of the module can be conducted only by its manufacturer.
The module does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.
If the module fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

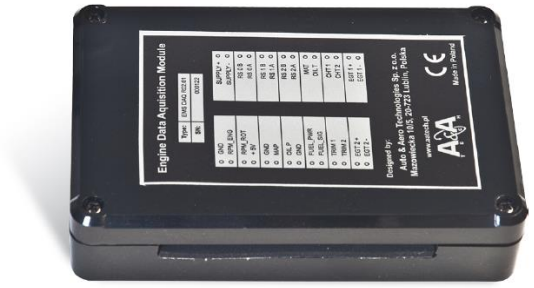
7.5.6.6.6. Re-programming

Modifications to the module's settings can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.6.6.7. Spare parts

The module does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.7 *Measuring module EMS DAQ R02.01*



Rev. 01 – May 2017

7.5.7.1. *Introduction*

This engine monitoring module EMS DAQ R02.01 is intended for ultralight, microlight, homebuilt and experimental aircraft. This module is not certified by the FAA and EASA. Fitting of this module to a certified aircraft is subject to the rules and conditions pertaining to such in your country. Please check with your local aviation authorities if in doubt.
This engine monitoring module EMS DAQ R02.01 is an element of the Integrated Avionics System that measures the following engine operation parameters:

- Engine speed;
- Rotor speed;
- Inlet air pressure;
- Inlet air temperature;
- Oil pressure;
- Oil temperature;
- Cylinder head temperature;
- Exhaust gases temperature;
- Fuel level;
- Pitch and roll trim position.

The purpose of EMS DAQ R02.01 type measuring module is to collect input, analyse it in terms of threshold levels, and record selected information. Measured values are communicated to the pilot by means of the following EEM MOT 01 displays: F02.01, F08.01 and F09.01.
Functionalities of the module include:

- analysing and recording instances of crossing thresholds of operating parameters,
- providing records and statistics on how often, to what extent and for how long parameter values were outside the desired range;
- recording flight time: from last engine start, and the total engine operation time (HOOBS).

The module is designed to work with ROTAX 912 UL, 912 ULS and 914 engines. A list of signals processed by the module together with sensor types is presented in Table 1.

Tab. 14 Sensors providing input for EMS DAQ R02.01 Module

No.	Parameter	Sensor
1	Engine speed	BRP TRIGGER COIL KIT 264087 [1]
2	Rotor speed	Autonics PR08-1.5DN
3	Inlet air pressure	Bosch 0 281 002 976
4	Oil pressure	BRP 456180 [1]
5	Oil temperature	BRP TEMPERATURE SENSOR 965531 [1]
6	Cylinder head temperature	BRP TEMPERATURE SENSOR 965531 [1] (2 sensors)
7	Exhaust gases temperature	BPR THERMO COUPLE NICR-NI K 966370 [1] (2 sensors)
8	Inlet air temperature	Bosch 0 281 002 976
9	Fuel level	Vdo 224-011-020-372g
10	Trim pitch and roll	Signal from actuator Linak La 12

[1] Standard sensor for ROTAX engine

The module's casing made of black ABS is splash-proof. Cables connecting sensors with printed circuit board of the device enter the casing via screw connection terminal blocks. The opening is sealed by means of sealing foam tape pasted to both parts of the casing.
Hardware identification plates are located in the front of the casing (Fig. 1) and inside (on circuit board).

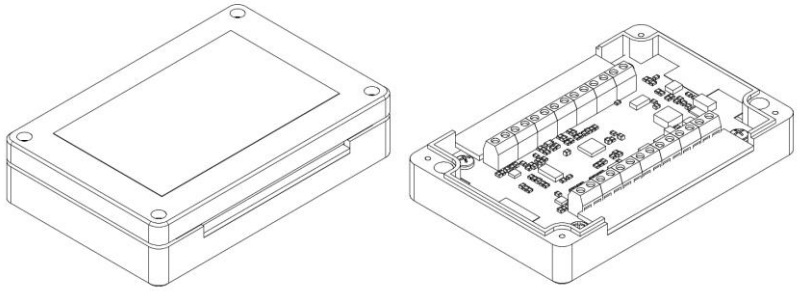


Fig. 45. EMS DAQ R02.01 module (complete casing and casing with lid removed)

7.5.7.2. General information

This manual contains binding information, guidelines and warnings for safe handling and maintenance of this particular instrument before installation, during installation and in its operating phase. This document does not contain rules and guidelines on operation of aircraft instruments at large.
Read the manual thoroughly before turning on the instrument and precisely follow the instructions to install and configure it. This manual does not replace instructions on installation, maintenance and operation of this device in a particular airframe - these are to be prepared by the user. Instructing the pilots and maintenance personnel on operation of the instrument is also the responsibility of the user.
Operation of this device is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this module and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.
This manual defines the scope of maintenance measures the user is authorised to conduct on their own. Any repairs or modifications outside this scope conducted by the user or contracted to a third

party, as well as using non-original parts and subassemblies voids the warranty, relieves the supplier from any liability, making the device lose the status of the product of Auto & Aero Technologies Sp. z o.o. with all the resulting consequences.

7.5.7.3. Handling in transport and storage

The EMS DAQ R02.01 module is bubble-wrapped to protect it against vibration and other physical damage, and packed in a cardboard box together with the warranty card.

The display must be stored and transported assuring that:

the ambient temperature stays in the range of 10 ÷ 40°C

the ambient relative humidity stays in the range of 10÷90 %, safe from condensation.

The display should be protected from water.

7.5.7.4. Installation

7.5.7.4.1. Environmental specifications

The EMS DAQ R02.01 module has been designed to be installed in engine compartment of ultralight aircrafts of ceiling not exceeding 3 000 m (10 000 ft). Acceptable ranges of operating parameters are listed below:

Operating temperature:	-20 ºC ÷ 50 ºC
Short-term operating temperature:	-25 ºC ÷ 60 ºC
Humidity:	0 ÷ 95 %, no condensation;
Ambient air pressure:	45 ÷ 105 kPa;
Vibrations:	<5 g at frequencies below 150 Hz;

7.5.7.4.2. Dimensions

Outline dimensions of the device are: 80 x 120 x 28 mm (*width x height x depth*), Weight: 160 g.

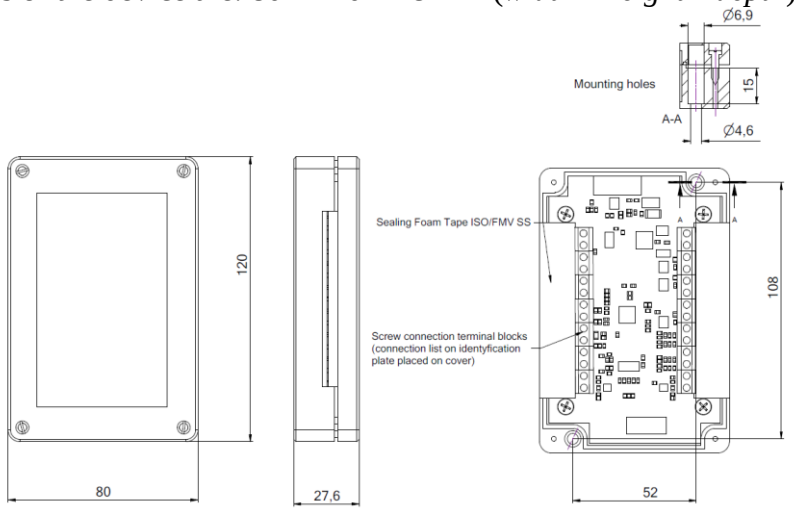


Fig. 46. EMS DAQ R02.01 module outline drawing

7.5.7.4.3. Mounting

The EMS DAQ R02.01 Module should be installed vertically using mounting holes (shown in Figure 2). The module should be located in a part of the engine compartment sheltered from splashes of water of other liquids, as close as possible to sensors and the battery.

7.5.7.4.4. Power and wiring

The EMS DAQ R02.01 module is powered from the aircraft power system. Power specifications: nominal supply voltage 12V, acceptable supply voltage range 8 ÷ 30V, current < 80mA.
The module is connected to the system by means of screw connection terminal blocks attached to printed circuit plate inside the casing. A schematic diagram of the connection is shown in Figure 3.

The power supply requires 0.75 mm^2 wires.
Sensor connection requires 0.5 mm^2 wires.
Thermocouple wires should be attached directly to the module's connector.
Data bus (RS0, RS1, RS2) requires twisted pair wires (2 x 0.5mm^2) according to DIN VDE 0814. Twisting should continue to the pins of the connector.
Power grounding to the battery clamp by means of a cable as short as possible (no longer than 0.5m).
Power, sensor and data bus wires are to be connected to the device with the lid removed, and placed with care so that the sealing tape of the lid and the case fit tightly.

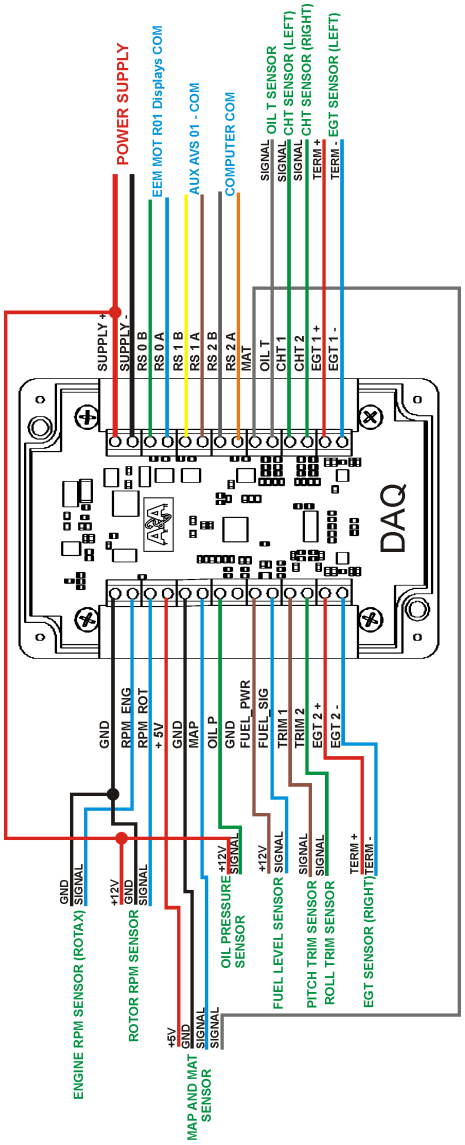


Fig. 1 EMS DAQ R02.01 Module connections

7.5.7.5. Operation and maintenance

The module is to be connected to EEM MOT 01 displays: F02.01, F08.01, F08.01 by RS485 (line RS0) and AUX AVS 01 module (line RS1) and diagnostic connector (line RS03).

7.5.7.5.1. Measured signals

The type and value range of signals measures by the Module are listed in Table 2.

Tab. 15 Signals processed by EMS DAQ R02.01 Module

No.	Parameter	Measurement range	Accuracy
1	Engine speed	0 ÷ 6500 rpm	± 10 rpm
2	Rotor speed	0 ÷ 500 rpm	± 1 rpm
3	Inlet air temperature	0,3 ÷ 4 bar abs.	± 0,1 bar
4	Oil pressure	0 ÷ 10 bar	± 0,1 bar
5	Oil temperature	-20 ÷ 200°C	± 2°C
6	Cylinder head temperature	-20 ÷ 200°C	± 2°C
7	Exhaust gases temperature	-50 ÷ 950°C	± 5°C

8	Inlet air temperature	-20 ÷ 200°C	± 2°C
9	Fuel level	10 ÷ 120 l	± 1 l
10	Trim pitch and roll	0 ÷ 10 V	± 0,1V
11	Flight time		± 1 s
12	Total engine running time (HOOBS)		± 1 min

7.5.7.5.2. Signal analysis

The EMS DAQ R02.01 Module analyses and records instances and duration of the signals' exceeding threshold values for selected engine parameters listed in Table 3. The records of threshold crossing contain the following information:

Type of occurrence;

Number of occurrences of each type;

Moment of occurrence defined by the number of system's starts from the fact of installing the system until the occurrence, total operation time of the system from its last start until the occurrence, and total engine operation time (HOOBS) until the occurrence.

Tab. 16 Types of threshold crossings recorded by EMS DAQ R02.01 Module

No.	Signal	Threshold levels
1	Engine speed	> 5500 rpm, if present for more than 5 min
2	Engine speed	> 5800 rpm
3	Rotor speed	> 450 rpm
4	Inlet air pressure	> 46 inHg
5	Oil pressure	< 1 bar, if engine speed greater than 900 RPM
6	Oil pressure	> 7 bar, if engine speed greater than 900 RPM
7	Oil temperature	> 130°C
8	Oil temperature	> 130°C, if present for more than 15 min
9	Oil temperature	> 150°C
10	Oil temperature	< 50°C, if rotor speed greater than 200 RPM
11	Cylinder head temperature – sensor 1	> 110°C
12	Cylinder head temperature – sensor 1	> 110°C, if present for more than 30 min
13	Cylinder head temperature – sensor 1	> 120°C
14	Cylinder head temperature – sensor 2	> 110°C
15	Cylinder head temperature – sensor 2	> 110°C, if present for more than 30 min
16	Cylinder head temperature – sensor 2	> 120°C

The occurrences of threshold crossing are recorded separately according to their type. The system remembers four last occurrences. Information on them is downloadable by means of a diagnostic connector, a converter, and a dedicated software. These logs (all or selected) can be cleared by the supplier of the aircraft and by the user.

The EMS DAQ R02.01 Module analyses and records statistics of selected parameters of engine and aircraft operation. These parameters are listed in Table 4. For each parameter, four value ranges are defined. The module records the following data:

Number of instances of a parameter entering a specific range,

Total duration of a parameter assuming values from a specific range.

The data are recorded separately for each parameter and for each of four value ranges. Information on the statistics is downloadable by means of a diagnostic connector, a converter, and a dedicated

software (not supplied with the device). The statistical records (all or selected) can be cleared from the module only by the supplier of the aircraft.

Tab. 17 Statistics of engine and aircraft operation parameters analysed and recorded by EMS DAQ R02.01 Module.

No.	Signal	Thresholds of value ranges			
		I	II	III	IV
1	Engine speed (rpm)	from 5500 to 5600	from 5600 to 5700	from 5700 to 5800	above 5800
2	Rotor speed (rpm)	from 400 to 425	from 425 to 450	from 450 to 475	above 475
3	Inlet air pressure (bar)	from 1,40 to 1,45	from 1,45 to 1,50	from 1,50 to 1,55	above 1,55
4	Inlet air temperature (°C)	from 50 to 55	from 55 to 60	from 60 to 65	above 65
5	Oil pressure (bar) – if engine speed >900 rpm	from 0,0 to 1,0	from 1,0 to 2,5	from 5,0 to 7,0	above 7,0
6	Oil temperature (°C)	poniżej 0	from 0 to 20	from 20 to 40	from 40 to 60
7	Oil temperature (°C) (if rotor speed > 200 rpm)	poniżej 0	from 0 to 20	from 20 to 40	from 40 to 60
8	Cylinder head temperature – sensor 1 (°C)	from 100 to 110	from 110 to 120	from 120 to 130	above 130
9	Cylinder head temperature – sensor 1 (°C)	from 100 to 110	from 110 to 120	from 120 to 130	above 130
10	Cylinder head temperature – sensor 2 (°C)	from 850 to 875	from 875 to 900	from 900 to 925	above 925
11	Cylinder head temperature – sensor 2 (°C)	from 850 to 875	from 875 to 900	from 900 to 925	above 925
12	Linear acceleration (g) [1]	from 2 to 4	from 4 to 8	from 8 to 12	above 12

[1] if connected to AUX AVS 01

7.5.7.5.3. Additional functionalities

Connecting the module to AUX AVS 01 communication module enables the system to analyse linear acceleration and to adjust brightness of EEM MOT 01 F02.01, F08.01 and F09.01 monitor displays (digital data about brightness level send form AUX AVS 01 to each monitors).

7.5.7.5.4. Readout of module records

To access records of engine and aircraft operating parameters, the EMS DAQ R02.01 Module needs to be connected to data bus RS2 (Figure 3) by means of RS485->USB converter. A software enabling data transmission can be downloaded from www.aatech.pl.

7.5.7.6. Service, diagnostics and repairs

7.5.7.6.1. Service life

TBO of the module is not defined.

In the case of failure or error, the module must not be used any more.

7.5.7.6.2. Checks

The following checks are recommended:

At pre-flight check:

Turn on the power to check if operational (the EEM MOT 01 F02.01, F08.01 and F09.01 monitors should display data);

After 100 hours of flight:

Check the instrument's electric connections:

Remove the lid of the monitor casing;

Check if wires sit firmly in screw connection terminal blocks,

Check for wire damage as frayed insulation;

Place wires flatly and in parallel in the case to avoid overlapping at the exit from the casing,

Attach the lid.

Turn on the power on to check if operational (check if EEM MOT 01 F02.01, F08.01 and F09.01 monitors display data);

Read/download EMS DAQ R02.01 records.

7.5.7.6.3. Cleaning and conservation

The casing is to be buffed with water-damped soft cloth. Optionally, if very dirty, can be cleaned with cloth sparingly damped with mild soap solution. Caution: avoid spilling liquids over the device.

7.5.7.6.4. Troubleshooting

If information is not displayed on some of the monitors (F02.01, 08.01, F09.01) when power is applied (Fig. 8), check connection inside measurement module. Check:

power connection; ensure that your power supply is capable of supplying at least 8 volts, and no more than 30 V.

data bus connection (RS0);

Fig. 47. Indication of no connection to measurement module

If the system does not react to brightness adjustment, check connection with AUX AVS 01 (RS1);

In the case of the module's failure or malfunction, turn power off and on again.

If the above does not solve the problem, the module needs to be replaced.

A defective module must not be used.

7.5.7.6.5. Repairs

Repairs and inspections of the module can be conducted only by its manufacturer.
The module does not contain any user-serviceable parts. Unauthorized repairs or modifications may result in permanent damage to the equipment and void the warranty.

If the module fails, return the device to the Manufacturer with description of the failure circumstances and symptoms.

7.5.7.6.6. Re-programming

Modifications to the module's settings can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.
The instrument's firmware updates are to be conducted on the basis of the bulletins published by the Manufacturer. The updates can be introduced by means of service software provided by the Manufacturer and the dedicated diagnostic interface.

7.5.7.6.7. Spare parts

The module does not contain any user-serviceable parts. The user is not allowed to disassemble it nor replace any subassemblies.

7.5.7.7. Warranty

Auto & Aero Technologies Sp. z o.o. warrants this product to be free from defects in materials and workmanship.

Auto & Aero Technologies Sp. z o.o. warrants proper operation of the product if it is used in accordance with its intended purpose and in accordance with the Operators and Maintenance Manual.

Auto & Aero Technologies Sp. z o.o. warrants this product for 12 months from date of purchase.

Auto & Aero Technologies Sp. z o.o. will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labour. The customer is, however, responsible for any transportation cost. The repair or replacement will be completed within 30 days from delivery of the product to Auto & Aero Technologies Sp. z o.o. However, if the failure is possible to be eliminated by means of updating the product's firmware, and if Auto & Aero Technologies Sp. z o.o. provides the customer with appropriate service tools, the Customer will conduct firmware update by themselves.

Any warranty repair will extend the warranty for the time of the repair.

If a valid warranty claim is lodged within months 7 to 12 after date of purchase, the warranty extends for a further 6 months after completion of the warranty repair.

This warranty does not cover failures due to:

mechanical damages and damages resulting from them,

unauthorised repairs,

damage caused by abuse or misuse,

unauthorised alterations to hardware or software.

The warranty does not cover claims that arise from the product parameters unless they are different from values declared by Auto & Aero Technologies Sp. z o.o.

The warranty does not cover activities that belong to normal operation such as cleaning and conservation, operation checks, and periodic inspections according to the Operators and Maintenance Manual.

The Customer loses all rights arising from the warranty if the product's protective seals are found to be tampered with.

The rejection of Auto & Aero Technologies Sp. z o.o. to conduct a warranty repair voids the warranty.

The information in this document is subject to change without notice and should not be construed as commitment by Auto & Aero Technologies Sp. z o.o.
These technical data and the information embfromied therein are the property of Auto & Aero Technologies Sp. z o.o., and shall not, without prior written permission of Auto & Aero Technologies Sp. z o.o., be disclosed in whole or in part to third parties. This statement shall be included on any reprfromuction of these data, in whole or in part. The Manual must remain with the engine/aircraft in case of sale.

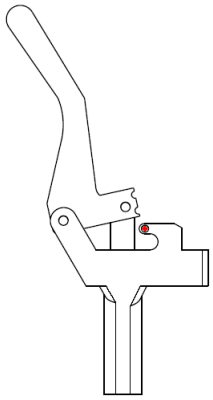
Other names in this documentation are used purely for ease of identification and may be trademarks of the respective company or owner.
Approval of translation has been done to best knowledge and judgement - in any case the original text in English language is authoritative.

7.6 Landing gear, Wheel Brakes

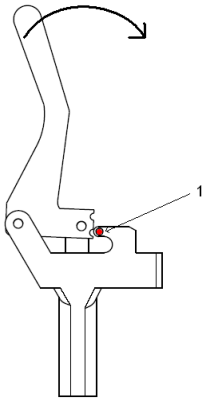
The gyrocopter is equipped with fixed tricycle landing gear. The main landing gear leg is elastic, made of composite. The forward leg, dampened only with the pneumatic wheel unit, is controlled only by using the rudder pedals.

Normal operating range of tyre pressure is 2,5 - 4 bar.

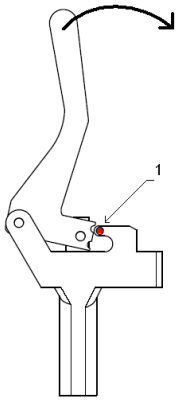
The main landing gear wheels are equipped with hydraulic disc brakes. The brakes are activated with the lever on the control stick and act simultaneously on both wheels.



Released Lever
Inactive Brakes



Position 1 – Medium Force
Active Brakes; Position Recommended during Parking



Position 2 – Large Force
Active Brakes; Position Recommended during Prerotation

To lock the brake lever in position 1 or 2, pull it to demanded position and press the red button (marked no 1). In order to release the brake, pull the lever harder to enable the automatic release of the lock.

CAUTION!

Do not use the brake during a long-lasting stopover.
It can cause damage to the braking system.

When taxiing or performing the landing run, brake without locking the lever.

Information on the sort of brake fluid and its replacement/replenishment are included in the Aircraft Maintenance Manual.

7.7 Seats and the Safety Belts

Two ergonomic bucket seats, made of composite, can be moved in front-aft direction in limited range. Adjusting the position can be performed during flight and consists of releasing seat lock by pushing lever beneath the seat.

Each seat is equipped with adjustable four-point belts.

7.8 Luggage Compartment

Luggage space is located in the area behind the seats. There, you can place luggage with a weight of 2x10 kg (2x22 lb). Luggage must be fastened so as to avoid the movement or scattering of its contents.

7.9 Glazing, Doors

The glazing is made of Plexiglas with a thickness of 3 mm and comprise of panoramic front pane, two roof panes, two panes in the bow part of the floor as well as the side doors almost entirely glazed on the left and right sides.

The doors open in the foreward direction. In the closed position, they are blocked with a lock accessible both from the outside and inside. In the door windows, air vents are fitted.

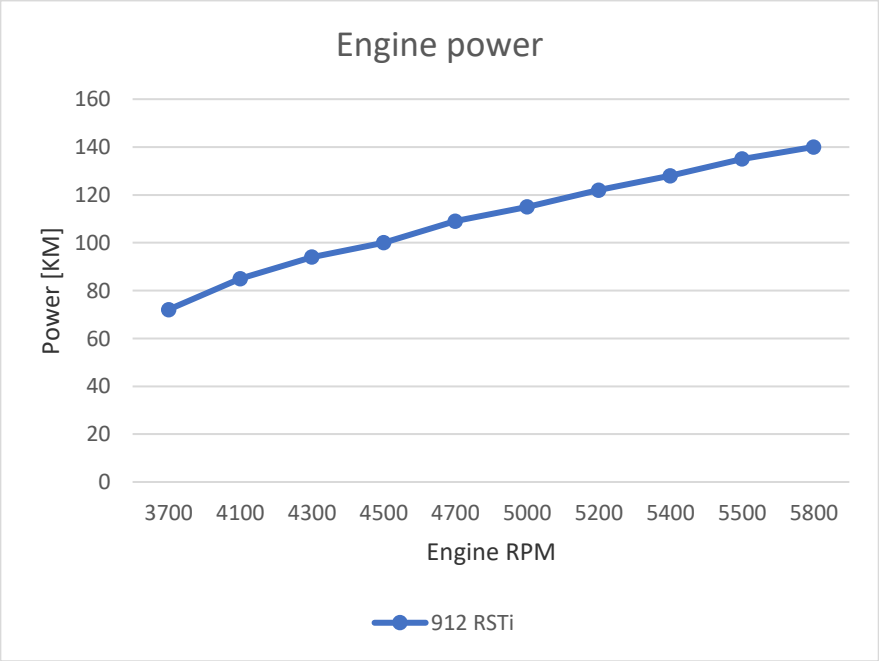
7.10 Power plant

7.10.1 Engine

TERCEL Carbon is driven with the **AAT 912 RSTi** engine.

The details concerning the parameters of the engine and its usage are included in the instruction manual of the **AAT 912 RSTi** engine.

AAT 912 RSTi engine characteristic



7.10.2 Propeller

The KASPAR Aero 2/3 LT three-blade, left-rotational propeller with a diameter of 1.72 m, is fitted in the pushing system, having the capability to manually change pitch. The hub and blades are made of composite reinforced with carbon fibre. The angle of blade setting measured 714 mm from axis of rotation is 12º.

7.11 Engine Oil

Traditional oils for aviation piston engines are not appropriate for Rotax engines! Due to the heavy load on the transmission, motorcycle oils with additions for gearboxes are recommended. Oils for heavy motorcycles 4-stroke engines meet all the requirements. Usually they are full-synthetic oils. It is essential to use only oils with the API classification: "SJ", "SG" or "SL".

Recommended oils are included in the Rotax engine manual.

Recommended oil: AeroShell Oil Sport PLUS 4 10W40.

Do not apply oils from diesel engines!

A diagram of the oil system and information on oil replacement/replenishment are included in the Aircraft Maintenance Manual.

The oil temperature optimal range for engine work is: 90 ºC ÷ 110 ºC.

If the oil temperature is not correct, it is possible to change the position of the oil cooler (see the Aircraft Maintenance Manual).

NOTE:

Do not use re-refined oil.

7.12 Fuel System

A diagram of the fuel system is included in the Aircraft Maintenance Manual.

Two connected composite fuel tanks are located close to the centre of gravity of the empty gyrocopter, so the quantity of fuel in the tanks does not significantly affect the behaviour of the machine in flight.

The capacity of the tanks is 80 dm^3. The tanks are located behind the seats. Fuel level is easy to evaluate by scales attached to translucent walls. Additional fuel level gauge is located on the instrument board.

It is essential to apply **lead-free** car petrol with the octane minimum number of 95, **recommended 98**.

NOTE:

Do not use AVGAS fuel.

Fuel consumption at a cross-country speed of V_C = 140 km/h (76 kt) is about 20 dm^3/h.

7.13 Electrical System

The diagram of the electrical system of the gyrocopter is presented in Chapter 2 of the Aircraft Maintenance Manual.

The main source of aircraft's electrical energy is the direct current generator mounted to the engine. The master switch is located on the central panel and is activated with the removable red key.

The electrical system provides power to all electrical appliances in gyrocopter(the ignition system, magnetos, the electromagnetic prerotation clutch (bendix), cockpit and navigation lights, pumps, sensors, instruments and additional appliances connected to installation. On the side of the instrument board, there is a 12V socket (a typical car socket for a lighter) giving the possibility of connecting additional devices.

Individual circuits are activated with appropriate described switches and protected with safety fuses. When the generator is not working (eg the engine is off, at low rotations or there is a failure), an orange charging indicator light turns on (on the instrument panel) and then the electrical units are powered from the battery.

7.14 Static and Total Pressure System

The total pressure feeder, in the form of a Pitot tube (made from plastic), is located at the bow of the gyrocopter fuselage. It is connected (with a plastic hose) directly to the speedometer. Static pressure to the speedometer, altimeter and vertical speed indicator is taken from the cabin, directly through the instrument connectors.

Chapter 8 Manoeuvring, Temporary Operation and Maintenance

8.1 Introduction

Chapter 8 contains procedures for proper manoeuvring on the ground and the operation of the gyrocopter as recommended by the manufacturer. It also specifies certain requirements concerning maintenance and operation which must be met if the gyrocopter is to retain its performance and reliability. It is sensible to comply with the planned schedule of lubrication and preventive maintenance adapted to encountered climatic and flight conditions.

8.2 Periodic Inspection of the Gyrocopter

Activities done within periodic inspection and the frequency of conducting them are defined in the Aircraft Maintenance Manual of the gyrocopter. Regardless of periodic inspection, the gyrocopter must be subjected to inspections required by the appropriate Aviation Authority to extend the validity of the authorization to perform flights. Required work within periodic inspection of the driving unit and accessories are defined in appropriate instructions and manuals.

The owner/user is responsible for the operation of the gyrocopter, who must guarantee that all the operation will be performed by authorized personnel.

8.3 Repairs and Modifications

Any repairs and modifications of the structure can only be made by authorized personnel and in an agreement with the gyrocopter manufacturer.

NOTE:

Before making any **modifications** to the gyrocopter
contact the appropriate aviation authority to make sure
the planned modification does not undermine the airworthiness.

After making reparations or modifications, weigh the empty gyrocopter and specify its position of the centre of gravity and enter the details in the table in subsection 6.4 of this manual.

8.4 Manoeuvring on the Ground, Road Transport

When transporting or moving the gyrocopter, the control stick should always be immobilized with a strap.

For road transport (on a trailer, in a container), detach the rotor (see subsection 3.1.2) and fix the gyrocopter to the base by the landing gear legs witch cargo belts (Figure 1).

Figure 1 Road transport

Moving the gyrocopter on the ground should be performed with great caution by using a forked drawbar grappled by the front wheel axle or a rope grappled by the front leg.

When parking with the rotor installed, tie the rotor to the fuselage by means of turnbuckles with pockets fitted on the blade tips or by using two straps.

8.5 Cleaning and Conservation

The outside surfaces of the fuselage, rotor and propeller must be washed with water with an addition of mild soap. Hard-to-wash stains of lubricant or oil can be removed by means of a lint free cloth wetted with heavy aliphatic petrol.

For seasoned painted surfaces, you can use any high-grade waxes or an abrasive compound of the automotive type. Soft fabrics or suede must be used for polishing.

The glazing is to be rinsed with clean water or a water solution with an addition of mild soap and next wiped up with clean soft fabric, sponge or suede. Exercise great caution with it to avoid scratches.

NOTE:

To clean the glazing do not apply agents containing alcohol!

The cockpit interior, chairs, rugs and upholstery should be cleaned with a vacuum cleaner. It is recommended to apply commercially available cleaning agents for car upholstery, however, the guidelines located on the wrapping must by strictly observed.

Clean the engine in accordance with the Engine Manual.

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Chapter 9 Supplements

9.1 Introduction

Chapter 9 includes appropriate supplements essential for the safe and efficient operation on the gyrocopter when it is equipped with various additional systems and equipment not applied in the standard variant.

9.2 List of Introduced Supplements

Document no.	Title of an Attached Supplement	Notes

In the “Notes” column, confirm by hand whether there is additional equipment or systems in the gyrocopter model for which this manual is intended.