

2. LIMITATIONS

**SECTION 2****2. LIMITATIONS**

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**AIRCRAFT OPERATING INSTRUCTIONS**

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2.1 Introduction

Section 2 contains operation limitation, instrument marking and basic placards necessary for safe operation of airplane and its engine, standard systems and equipment.

Limitation for optional systems and equipment are stated in section 9 - Supplements.

2.2 Airspeed

Airspeed limitations and their meaning for operation are stated in the table below:

Speed		IAS	mph IAS	Meaning
V_{NE}	Never exceed speed	146	168	Do not exceed this speed in any operation.
V_{NO}	Maximum structural cruising speed	115	132	Do not exceed this speed, with exception of flight in smooth air, and even then only with increased caution.
V_A	Maneuvering speed	90	104	Do not make full or abrupt control movement above this speed, because under certain conditions the aircraft may be overstressed by full control movement.
V_{FE}	Maximum flap extended speed	70	81	Do not exceed this speed with the given flap setting.



2.3 Airspeed indicator marking

Airspeed indicator markings and their color-code significance are shown in the table below:

Marking	Range		Meaning
	KIAS	mph IAS	
Red line	33	38	V _{S0} at maximum weight (flaps in landing position 50°)
White arc	33 - 70	38 – 81	Operating range with extended flaps. Lower limit- V _{S0} at maximum weight (flaps 50°) Upper limit - V _{FE}
Green arc	34 - 115	39 – 132	Normal operation range Lower limit - V _{S1} at maximum weight (flaps 0°) Upper limit - V _{NO}
Yellow arc	115 - 146	132 - 168	Maneuvers must be conducted with caution and only in smooth air
Red line	146	168	Maximum speed for all operations - V _{NE} .

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2.4 Powerplant

Engine manufacturer:	Bombardier-Rotax GMBH	
Engine type:	ROTAX 912 ULS (S2 for IFR version)	
Power:	maximum take-off	73.5 kW / 100 HP
	maximum continuous	69 kW / 95 HP
Engine speed:	maximum take-off	5800 RPM
		max. 5 minutes
	maximum continuous	5500 RPM
Coolant temperature:	idle	1400 RPM
	maximum	248 °F
Oil temperature:	maximum	266 °F
Oil pressure:	optimum operation	190 - 230 °F
	maximum	102 PSI
Fuel pressure:	minimum	12 PSI
	optimum operation	29 - 73 PSI
Fuel grades:	minimum	2.2 PSI
Oil grades:	see 2.13,	
Reducer gear ratio:	see 2.14,	
Propeller:	2.43 : 1	
Prop manufacturer:	Standard installed:	IFR version:
Propeller type:	WOODCOMP s.r.o.	Warpdrive
	KLASSIC 170/3/R	Warpdrive CF
	3 blade	Nickel protection of
	composite	blade leading edges
	ground adjustable	3-bladed, composite
Propeller diameter:		Ground adjustable
Maximum prop speed:	68 in	68 in
	2600 RPM	2600 RPM

NOTE

If installed a different propeller type - see section
9 - Supplements for propeller limitations.



2.5 Powerplant instrument marking

The color-code of instruments is shown in the following table:

Instrument	Units	Red line	Green arc	Yellow arc	Red line
		Lower limit	Normal operation range	Caution range	Upper limit
RPM indicator	RPM	-	1400 - 5500	5500 - 5800	5800
Oil temperature indicator	°F	-	190 - 230	120 - 190 230 - 266	266
Oil pressure indicator	PSI	12	29 - 73	12 - 29 73 - 102	102
Coolant temperature	°F	-	194 - 230	-	248

2.6 Miscellaneous instrument marking

There are not other instruments with color marking.

2.7 Weight

Empty weight (average equipment)	740 lbs ± 2 %
Maximum take-off weight	1268 lbs - no vortex generators 1320 lbs - with vortex generators
Maximum landing weight	1268 lbs - no vortex generators 1320 lbs with vortex generators
Maximum weight in baggage compartment	55 lbs

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WARNING

DO NOT EXCEED MAXIMUM WEIGHTS! THEIR EXCEEDING LEADS TO AIRPLANE OVERLOADING AND TO DEGRADATION OF FLIGHT CHARACTERISTICS AND DETERIORATION OF MANOEUVRABILITY.

2.8 Centre of gravity

Empty airplane C.G. position 14 ± 5 %MAC
(standard equipment)

Operating C.G. range 13 to 33 %MAC

Reference datum origin is the 2.21 in (56.15 mm) behind wing leading edge. MAC = 46.67 in (1185.5 mm)

2.9 Approved maneuvers

HARMONY LSA airplane is approved to perform the following maneuvers:

- steep turns up to bank angle of 60°
- climbing turns
- lazy eights
- stalls (except for steep stalls)
- normal flight maneuvers

WARNING

AEROBATICS AS WELL AS INTENTIONAL SPINS ARE PROHIBITED!

2.10 Maneuvering load factors

Maximum positive load factor 4.0

Maximum negative load factor -2.0

2.11 Flight crew

Minimum crew 1 pilot

Minimum weight of crew 121 lbs

Maximum weight of crew acc. to chapter 6.



WARNING

DO NOT EXCEED MAXIMUM WEIGHTS! THEIR EXCEEDING LEADS TO AIRPLANE OVERLOADING AND TO DEGRADATION OF FLIGHT CHARACTERISTICS AND DETERIORATION OF MANOEUVRABILITY.

2.12 Kinds of operation

The airplane is standard approved for VFR daylight flights.

WARNING

NIGHT FLIGHTS ACCORDING TO VFR, FLIGHTS ACCORDING TO IFR (BY INSTRUMENTS) ARE APPROVED ONLY WHEN INSTRUMENTATION REQUIRED FOR SUCH FLIGHTS IS INSTALLED AND FLIGHT PERFORMED BY A PILOT WITH APPROPRIATE RATING!

NOT AUTHORIZED FOR FLIGHT INTO KNOWN OR FORECAST POSSIBLE ICING CONDITIONS.

NOT AUTHORIZED FOR FLIGHT WITHIN 25 MILES OF KNOWN LIGHTNING OR THUNDERSTORMS.

Instruments and equipment for Day VFR flights:

- 1 Airspeed indicator (the color marking according to par. 2.3)
- 1 Sensitive barometric altimeter
- 1 Magnetic compass
- 1 Fuel gauge indicator
- 1 Oil temperature indicator
- 1 Oil pressure indicator
- 1 Cylinder head temperature indicator
- 1 Engine speed indicator
- 1 Safety harness for every used seat

Instruments and equipment for Night VFR flights:

F 2245 Annex 2 LSA to be flown at night

Instruments and equipment for IFR flights:

FAR 91.205 and

F2245 Annex 3 Additional Requirements for Light Sport Airplanes Operated under Instrument Flight Rules, as proposed till 1.1.2009. Refer to Supplement IFR to this standard Aircraft Operating Instructions. Flights under IMC prohibited!

CAUTION

ADDITIONAL EQUIPMENT NECESSARY FOR AIRPLANE OPERATION IS GIVEN IN APPROPRIATE OPERATION REGULATION OF AIRPLANE OPERATOR'S COUNTRY.

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2.13 Fuel

The following fuels can be used :

	Usage / Description	
	912 UL / A / F	912 ULS / S
MOGAS		
European standard	EN 228 Normal ¹⁾	
	EN 228 Super ¹⁾	EN 228 Super ²⁾
	EN 228 Super plus ¹⁾	EN 228 Super plus ²⁾
Canadian standard	CAN/CGSB3.5 Quality 1 ³⁾	CAN/CGSB3.5 Quality 3 ⁴⁾
US standard	ASTM D4814	ASTM D4814
AVGAS		
US standard	AVGAS 100 LL (ASTM D910)	AVGAS 100 LL (ASTM D910)

¹⁾ min. ROZ 90²⁾ min. ROZ 95³⁾ min. AKI* 87⁴⁾ min. AKI 91

AVGAS 100LL places greater stress on the valve seats due to its high lead content and forms increased deposits in the combustion chamber and lead sediments in the oil system. Thus it should only be used in case of problems with vapor lock or when other types of gasoline are unavailable.

■ **CAUTION:** Use only fuel suitable for the respective climatic zone.

◆ **NOTE:** Risk of vapour formation if using winter fuel for summer operation.

■ **CAUTION:** Obey the latest edition of Service Instruction SI-912-016 for the selection of the correct fuel.

Fuel tank volume (each)	15.85 U.S. gallons
Total	31.7 U.S. gallons
Usable fuel	31.2 U.S. gallons
Unusable fuel	0.5 U.S. gallons (0.25 US gal per tank)

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NOTE

It is not recommended to fully tank the fuel tanks. Due to fuel thermal expansion keeps about 2.11U.S. Gallons of free space in the tank to prevent fuel bleed through the vents in the wing tips thus preventing environmental contamination. This should be adhered especially when cold fuel from an underground tank is tanked.

2.14 Oil

Performance classification SF, SG according to API

Oil volume:

- | | |
|-----------|-------------------|
| - minimum | 0.53 U.S. gallons |
| - maximum | 0.79 U.S. gallons |

2.15 Maximum number of passengers

Maximum number of passengers including pilot 2

2.16 Other limitations

SMOKING IS PROHIBITED on the airplane board.

PASSENGER NOTICE

This aircraft conforms to ASTM Consensus Standards of airworthiness developed and maintained by the aviation community under ASTM Technical Committee F37.

PASSENGER WARNING!

This aircraft was manufactured in accordance with Light Sport Aircraft airworthiness standards and does not conform to standard category airworthiness requirements.

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2.17 Limitation placards

The following placards are located on the instrument panel:

**BEFORE TAKE-OFF PUSH CANOPY HANDLE UP
TO CHECK CANOPY FULL CLOSING****WARNING
ASI AND ALT ON EFIS ARE INFORMATIVE ONLY!
SEE ANALOGUE INSTRUMENTS.****FUEL QUANTITY INDICATION IS ACCURATE
ONLY IN LEVEL FLIGHT ATTITUDE**

The following placards are located on the tilting canopy:

**PASSENGER NOTICE:
THIS AIRCRAFT CONFORMS TO ASTM
CONSENSUS STANDARDS OF AIRWORTHINESS
DEVELOPED AND MAINTAINED BY THE
AVIATION COMMUNITY UNDER ASTM
TECHNICAL COMMITTEE F37.****PASSENGER WARNING!
THIS AIRCRAFT WAS MANUFACTURED IN
ACCORDANCE WITH LIGHT SPORT AIRCRAFT
AIRWORTHINESS STANDARDS AND DOES NOT
CONFORM TO STANDARD CATEGORY
AIRWORTHINESS REQUIREMENTS.**

This placard is located on the top of fixed rear canopy:

**CANOPY IS UNLOCKED IF A LATCH
IS VISIBLE UNDER THE GLASS**

Note: for painted top of the rear glass the latch is visible when looking sideways from under the painted area.

These placards are located on the tip-up canopy close to rear guide pins:

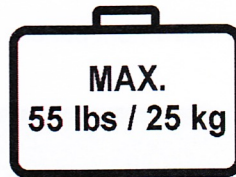
**CAUTION !
FINGERS OFF
WHEN CLOSING
THE CANOPY!**



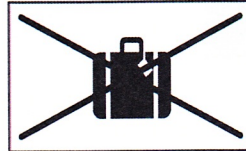
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The following placard is located in the baggage compartment:



The following placard is located behind the baggage compartment:



It prohibits use of that place for additional stowage due to airplane aft C.G. limit.



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The following placards are located on sides of the tip-up canopy:

Day VFR airplane

This Light Sport Aircraft has been approved only for VFR day flights under no icing conditions.

Or (Night VFR airplane)

This Light Sport Aircraft has been approved only for day/night VFR flights under no icing conditions.

or (IFR airplane)

This Light Sport Aircraft has been approved by the Manufacturer for IFR flights with the following limitations:

Not authorized for IFR flights into known or forecast possible icing conditions.
Not authorized for IFR flights within 25 miles of known lightning or thunderstorms.

and (all versions)

Aerobatics and intentional spins are prohibited!

AIRSPEED IAS	
Never exceed	146 kts
Manoeuvring	90 kts
Max. Flap Extended	70 kts
Stalling	33 kts

ENGINE SPEED	
Max. Take-off (max. 5 min.)	5800 rpm
Max. Continuous	5500 rpm
Idling	1400 rpm

Unusable quantity of fuel	0.5 USgal
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Aerobatics and intentional spins are prohibited!

AIRSPEED IAS	
Never exceed	168 MPH
Manoeuvring	104 MPH
Max. Flap Extended	81 MPH
Stalling	38 MPH

ENGINE SPEED	
Max. Take-off (max. 5 min.)	5800 rpm
Max. Continuous	5500 rpm
Idling	1400 rpm

Unusable quantity of fuel	0.5 USgal
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or

Valid with vortex generators

LOAD LIMITS							
Max. take-off weight		1320 lbs					
Empty weight		700 lbs					
Max. baggage weight		55 lbs					
PERMITTED CREW WEIGHT							
		[lbs]					
Fuel quantity	U.S. gal.	30.0	25.0	20.0	15.0	10.0	5.0
Baggage weight	max. 55 lbs	385	415	445	475	505	535
	1/2 28 lbs	412	442	472	502	532	562
	No baggage	440	470	500	530	560	590
Fuel reserve		2 U.S. gallons					

No vortex generators

LOAD LIMITS								
Max. take-off weight		1268 lbs						
Empty weight		700 lbs						
Max. baggage weight		55 lbs						
PERMITTED CREW WEIGHT [lbs]								
Fuel quantity		U.S. gal.	30.0	25.0	20.0	15.0	10.0	5.0
Baggage weight	max. 55 lbs		333	363	393	423	453	483
	1/2 28 lbs		360	390	420	450	480	510
	No baggage		388	418	448	478	508	538
Fuel reserve		2 U.S. gallons						

NOTE

The values stated on the placard "LOAD LIMITS" are valid for the empty weight of the airplane with average equipment. The placard with values valid for the actual empty weight of the airplane will be placed in the cockpit.

Other placards and labels are shown in Aircraft Maintenance and Inspection Procedures.



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