STEMME
FLUGPLATZSTRASSE F2, NR. 6-7 • GERMANY • 15344 STRAUSBERG

MAINTENANCE MANUAL

POWERED SAILPLANE

STEMME S10, VARIANT S12

DOCUMENT NUMBER • L500-912850

DATE OF ISSUE • DECEMBER 20, 2016

The technical content of this document is approved under the Authority of DOA ref. EASA.21J.250.

THE PAGES FORMING THE AIRWORTHINESS LIMITATIONS SECTION HAVE BEEN FAA APPROVED.

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STEMME AG MPL 1 EASA.21J.250

SIGNATURE .....

AIRFRAME TYPE	: STEMME S12
TYPE CERTIFICATE	: G06CE
SERIAL NUMBER	: 12-
REGISTRATION	:

This aircraft may only be maintained in accordance with the instructions given in this manual.

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0.1 RECORD OF AMENDMENTS

Any revision of the present manual must be recorded in the following table, with the exception of:

- Installation status of optional equipment, for optional equipment refer to section »9«,
- Amendments to the original ROTAX Maintenance Manual for the ROTAX 914 F (refer to Annex E).

The record of amendments in section »0.1« and the list of effective pages in section »0.2« are assigned to an individual aircraft serial number. The indicated amendment no. in the feed line of these pages does not change with entries after delivery of the aircraft.

Revision of pages must be endorsed in the following list. Necessary amendments, needs to be mandatory included in the present manual.

The new or amended text will be marked on the revised page by a black vertical line on the right hand margin; the amendment number and the date will be shown in the outside of the footer page. The inspector certifies by his signature the correspondence of this individual Aircraft Maintenance Manual and the following list with the aircraft designated by serial number.

Any modification or correction within the approved sections must be signed by the Competent Authority. Information about amendments which must be inserted in this Manual, are given in the »Record of Airworthiness Directives and Service Bulletins« (refer to Annex B).

The original ROTAX Maintenance Manual for the ROTAX 914 F is separately revised by BRP-ROTAX® GmbH & Co.KG, Austria (refer to Annex E).

The insertion must be signed by the performing person. The actuality and correct insertion of amendments will be check during the annual airworthiness review.

Am. No.	Removed Pages	Inserted Pages	Date of Amendment	Reference	Approval	Date of Insertion	Signature
00	--	Initial Issue	DEC 20, 2016	P061-2017-016			
01	0-1, 0-3, 0-5,0-7, 0-8 2-1, 6-4, 6-5, 6-6, 6-7, 6-10, 8-1, D-9	0-1, 0-3, 0-5,0-7, 0-8 2-1, 6-4, 6-5, 6-6, 6-7, 6-10, 8-1, D-9	AUG 28, 2017	P061-2017-094			

Am. No.	Removed Pages	Inserted Pages	Date of Amendment	Reference	Approval	Date of Insertion	Signature
02	0-1, 0-2, 0-3, 0-4, 0-5, 0-6, 0-7, 0-8, 0-9, 0-18, 0-19, 1-1, 3-11 3-14, 3-19, 3-20, 3-30 3-39,3-40, 3-41,3-44, 3-45, 3-46, 3-51,3-52, 3-53,3-54, 3-55,3-56, 3-57, 3-61, 4-1, 4-2, 4-3, 5-37, 6-13, 7-20, 7-29, 7-35, 7-52 11-1, A-1, D-3, D-5, D-9, F-1...F-20	0-1, 0-2, 0-3, 0-4, 0-5, 0-6, 0-7, 0-8, 0-9, 0-18, 0-19, 1-1, 3-11 3-14, 3-19, 3-20, 3-30 3-39, 3-40, 3-41,3-44, 3-45, 3-46, 3-51, 3-52, 3-53, 3-54, 3-55, 3-56, 3-57, 3-61, 4-1, 4-2, 4-3, 5-37, 6-13, 7-20,7-29, 7-35, 7-52 7-53, 7-54 11-1, A-1, D-3, D-5, D-9, F-1...F-56	OCT 10, 2018	P061-2017-162			
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REVISION 03 "GARMIN G3X SYSTEM" IS STILL UNDER THE APPROVAL BY THE FAA.

0.2 LIST OF EFFECTIVE PAGES

This list is only valid for the serial no. specified on title page. The list contains all amendments of the maintenance manual, effective until final approval of this serial no. amendments added later must be recorded.

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0.3 CONTENTS

1. GENERAL

1.1 REMARKS ON MAINTENANCE

The legal owner or operator of the STEMME S12 is obliged to ensure that the maintenance of the aircraft follows the instructions of this manual in accordance with applicable national laws and regulations. Among others, these include:

- Scheduled maintenance,
- Adjustments,
- Replacement of fluids and lubricants,
- Replacement of parts after expiration of their service life,
- Minor repairs.

Any maintenance work must be documented (aircraft logbook).

The manufacturer must be informed immediately in case of any change of ownership. The message must be confirmed by the manufacturer, so that all information concerning airworthiness (AD´s, SB´s) can be given to the legal owner.

For maintenance work the following documents are relevant:

1. This Maintenance Manual for the motorglider STEMME S12.
2. STEMME - Flight Manual for the motorglider STEMME S12.
1. ROTAX - Maintenance Manual (Line Maintenance) for ROTAX Engine Type 914 Series.
2. ROTAX - Maintenance Manual (Heavy Maintenance) for ROTAX Engine Types ROTAX 912 and 914 Series.
3. ROTAX - Operating Manual ROTAX 914 F.
4. ROTAX - Installation Manual ROTAX 914 F.
5. ROTAX - Main Overhaul Manual ROTAX 914 F.
6. ROTAX - Illustrated Parts Catalog ROTAX 912/914 series.
7. STEMME Document Number A26-11AM-M: Technical Specification of the ROTAX 914 F2/S1.
8. Maintenance instructions for the L'Hotellier quick-disconnects in flight control system.
9. Manufacturer's documents referring to the equipment listed in the equipment list of the corresponding S/N.
10. SB´s published by STEMME, ROTAX and manufacturer of other equipment installed.
11. Maintenance Instructions from STEMME.
12. Service Information from ROTAX.
13. Aircraft Logbook.

The amount and kind of maintenance work depend on the aircraft utilization, the climate, airfield conditions, storage facilities and other factors, irrespective of the periodic checks. E. g., in sandy environs it might be necessary to clean all filters before every commencement of operation; on the other hand in coastal or in rainy regions it is important to take more care of the preservation

of the aircraft.

The instructions in this manual are valid under normal conditions and use.
Use only spare parts from the manufacturer or according to the manufacturer's requirements.

NOTICE

Materials required and recommended procedures for minor repairs on composite materials are indicated in the repair guide »Small Repairs of Composite Materials« in Annex A of the S12 Aircraft Maintenance Manual.

In case of any incident endangering airworthiness, the manufacturer must be informed immediately.
Maintenance work must be performed by qualified personnel.

NOTICE

This Maintenance Manual does not include instructions for assembly, daily inspection and Pre-flight inspection, which are provided in section »4 Normal Operating Procedures« of the S12 Aircraft Flight Manual. To perform these procedures, the S12 Aircraft Flight Manual must be available to the maintenance personnel.

1.2 CONVERSION TABLE

For the conversion of technical data the following factors have been used:

Data	Factor
1 cubic in	16.387 cm^3
1 dr	1.772 g
100 fpm	0.508 m/s
1 ft	0.3048 m
1 ft lb	1.356 Nm
1 hp	0.7457 kW
1 Imp.gal.	4.546 l
1 in	25.4 mm
1 inHg	33.86 hPa
1 kgm	86.8 lb in
1 kgmm	0.001 kgm
1 kgmm	0.007 lb ft
1 kt	1.852 kph
1 lb	0.4536 kg
1 lbf	4.45 N
1 lbf ft	135.6 Ncm
1 mph	1.609 kph
1 sqft	0.0929 m^2
1 oz.	28.349 g
1 psi	0.06895 bar
1 US gal.	3.785 l

1.3 ABBREVIATIONS

The following abbreviations are being used for clarity:

ACL	Anti-Collision Light
AD's	Airworthiness Directives
AGL	Above Ground Level
AMM	Aircraft Maintenance Manual
ANSI	American National Standards Institute
AOA	Angle Of Attack
ASAP	As Soon As Possible
ASI	Airspeed Indicator
AUW	All-Up-Weight
CB	Circuit Breaker
CCT	Cylinder Coolant Temperature
CD	Constant Depression
CFRP	Carbon Fiber Reinforced Plastic
CG	Center Of Gravity
CHT	Cylinder Head Temperature
DCDI	Dual Capacitive Discharge Ignition
EFIS	Electronic Flight Information System
EMC	Electromagnetic Compatibility
EQL	Equipment List
FBO	Fixed-Base Operator
FOD	Foreign Object Damage
FRP	Fiber Reinforced Plastic
GEN	Generator
GDU	GARMIN Display Unit
GEA	GARMIN Engine Analyser
GFRP	Glass Fiber Reinforced Plastic
GPS	Global Positioning System
IMC	Instrument Meteorological Conditions
IPC	Illustrated Parts Catalog
KIAS	Knots Indicated Airspeed
kt	Knots (equivalent to KIAS)
LBA	Luftfahrtbundesamt - German Civil Aviation Authority
LH	Left Hand
MAP	Manifold Pressure
MCP	Maximum Continuous Power
MEL	Minimum Equipment list
MMEL	Master Minimum Equipment list
MNLP	Maximum Weight of Non Lifting Parts

MSB	Main System Battery
MTOW	Maximum Take-Off Weight
NLP	Non Lifting Part
OAT	Outside Air Temperature
OVP	Over Voltage Protection
PIC	Pilot In Command
PPC	Propeller Pitch Control
PTT	Push To Talk
R/C	Rate Of Climb
RH	Right Hand
RP	Reference Plane
RPM	Revolutions Per Minute
RTD	Resistance Temperature Detector
RWY	Runway
SB's	Service Bulletins
SI	Service Information
SL	Service Letter
STC	Supplemental Type Certificate
TBO	Time Between Overhaul
TBR	Time Between Replacement
TC	Type Certificate
TCDS	Type Certificate Data Sheet
TCU	Turbocharger Control Unit
TE	Total Energy
T/O	Take-Off
TSO	Technical Standard Order
TTL	Transistor-Transistor Logic

1.4 SAFETY SYMBOLS

The following safety instructions are based loosely on the ANSI Z535.

Symbols	Z535.3 Criteria for Safety Symbols
Signs and Labels	Z535.4 Product Safety Signs and Labels
Product Safety	Z535.6 Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials.

⚠ WARNING	WARNING An operating procedure or technique that may result in personal injury or loss of life if not followed.
⚠ CAUTION	CAUTION An operating procedure or technique that may result in damage to equipment if not followed.
NOTICE	NOTICE An operating procedure or technique needing special emphasis.

3.7 ELECTRICAL SYSTEM

3.7.1 GENERAL SYSTEM ARCHITECTURE

The electrical system of the S12 consists of two independent, separate sub-systems: the main system and the engine system. Each system incorporates a dedicated battery and generator (actually an alternator and rectifier for the main system). Failures of one system will not interfere the other system. There is no provision to cross-tie the two sub-systems.

The engine system powers exclusively those devices needed to operate the engine or which are available only when the engine is running. Under normal conditions the engine system battery is charged by the internal generator of the ROTAX engine. In gliding flight the engine system is shut off completely. The operational mode of the engine battery is a stand-by mode, as it is normally used only for engine starting. Under normal conditions it will not be discharged.

The main system powers all other devices of the aircraft.
The standard main system is based on one fix installed main battery behind the engine compartment. The main system can be extended optionaly by a second removable main battery in the rear baggage compartment.

During powered flight the main battery is charged by the external belt driven alternator.
In standard configuration the fixed installed main battery will be charged. If the 2nd main battery is installed the external belt driven alternator will charge only the selected main battery (standard or optional battery).

During gliding flight the main system battery powers all active devices. Once the main system battery/batteries is/are exhausted, the pilot is able to restart the engine using the still fully charged engine system battery.

After successful restart of the engine, the external alternator will power the main system and will recharge the connected main system battery. The operational mode of the main system battery is as a storage battery in cycle mode. Under normal conditions it will be regularly discharged and recharged.

The optional installed 2nd main batttery is designed as portable unit, therefore it can be also charged outside of the aircraft.

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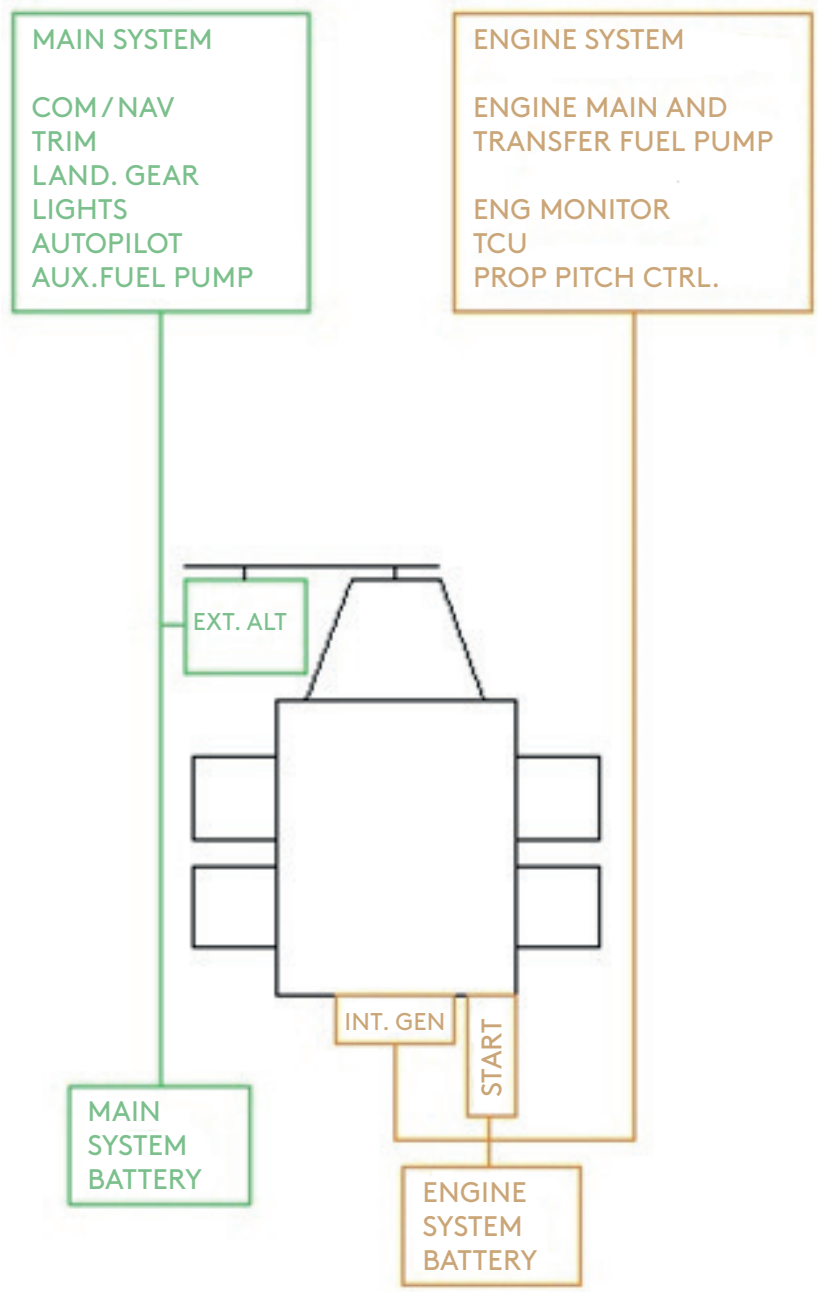

Figure 3.7.a
Electrical System S12 - Standard

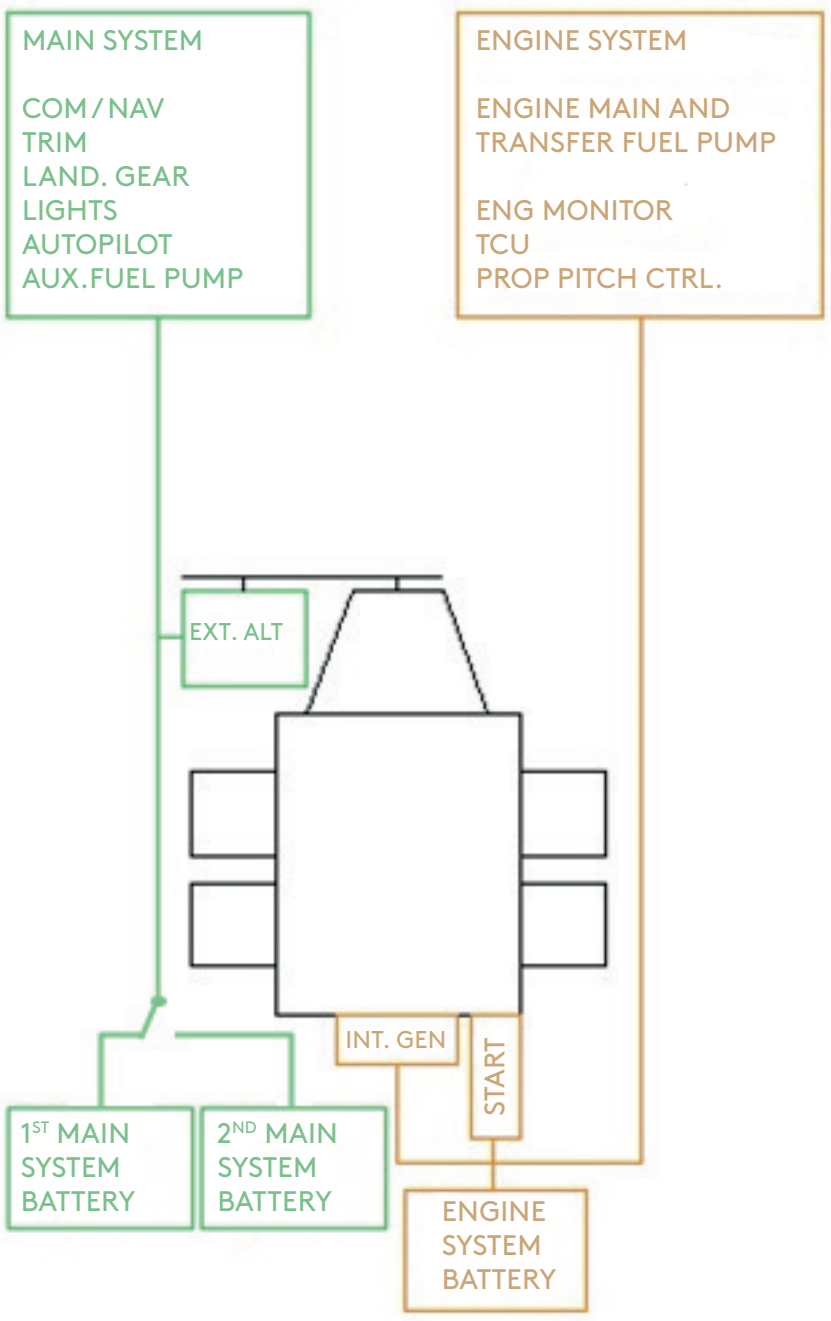

Figure 3.7.b
Electrical System S12 - 2nd Main System Battery

3.7.2 DC GENERATION (ATA 24-30-00)

3.7.2.1 MAIN SYSTEM DC POWER GENERATION

The DC power for the main system is generated by the belt-driven alternator of the engine and stored in a LiFePO4 battery.

STANDARD MAIN SYSTEM BATTERY (INITIAL EQUIPMENT 12-001 UP TO 12-021)

Type	Super B SB12V19E-EC
STEMME p/n	831489
Nominal Voltage	12.8 V
Nominal Capacity C1	19.2 Ah
Technology	Lithium Iron Phosphate LiFePO4
Protection device	Over-voltage protection device OVP-15.5
Location	Battery case at front ring frame of tail boom

STANDARD MAIN SYSTEM BATTERY (INITIAL EQUIPMENT 12-022 AND FOLLOWING AND RETROFITED ACCORDING TO SERVICE BULLETIN DOC.-NO.: P061-980028)

Type	Super B SB12V20P-FC
STEMME p/n	832828
Nominal Voltage	12.8 V
Nominal Capacity C1	20.0 Ah
Technology	Lithium Iron Phosphate LiFePO4
Protection device	Over-voltage protection device OVP-15.5
Location	Battery case at front ring frame of tail boom

SECOND MAIN SYSTEM BATTERY (OPTIONAL)

Type	Super B SB12V20P-FC
STEMME p/n	832828
Nominal Voltage	12.8 V
Nominal Capacity C1	20.0 Ah
Technology	Lithium Iron Phosphate LiFePO4
Protection device	Over-voltage protection device OVP-15.5
Location	Removable Battery case at the rear baggage compartment

MAIN SYSTEM ALTERNATOR

Type	Nippon Denso 42A,
STEMME p/n	830600
Drive	V-Belt
Excitation	External, controlled automatically depending on running engine
Field circuit protection	5 A fuse
Nominal Voltage:	14 V
Max Output Power	42 A
Voltage Regulator	built-in
Regulated Voltage	14.2 – 14.8V @ 25°C
Qualification	The alternator is part of the certified aircraft engine ROTAX 914 series
Location	Left side of propeller gear housing of engine

FUNCTION

When aircraft master switch is switched ON the main system master relay connects the battery to the system. From that moment on all devices supplied by main system are powered, except those with a dedicated ON/OFF switch. When the engine is running, the external alternator switch switches on the field circuit of the alternator and the alternator starts to generate voltage. The alternator output is controlled by a voltage regulator built in the alternator. A red warning light indicates failures at the alternator, e.g. a broken V-belt.

3.7.2.2 ENGINE SYSTEM DC POWER GENERATION

The DC power for the engine system is generated by the crankshaft-mounted generator of the engine and stored in a LiFePO4 battery. The battery is used to crank the engine to start.

ENGINE SYSTEM BATTERY

Type	Super B SB12V7800P-CC
STEMME p/n	831488
Nominal Voltage	13.2 V
Nominal Capacity C1	7.8 Ah
Technology	Lithium Iron Phosphate LiFePO4
Protection device	Over-voltage protection device OVP-15.5
Qualification	Airworthiness and eligibility are proven in /A/
Location	Battery case at front ring frame of tail boom

ENGINE SYSTEM INTERNAL GENERATOR

Type	ROTAX (Part of engine)
STEMME p/n	n/a
Drive	crankshaft, directly mounted
Excitation	permanent magnet
Nominal Voltage	14 V
Max Output Power	18 A
Voltage Regulator	external rectifier-regulator (ROTAX)
Regulated Voltage	13.7 – 14.3 V
Qualification	The generator is part of the certified air raft engine ROTAX 914 series
Locations	Coils and magnets mounted on aft end of crankshaft housing, voltage regulator installed on TCU-Starter-Board.

FUNCTION

If aircraft master switch is switched ON and the aircraft nose cone is opened and locked, a micro switch at the nose cone lever activates the engine system master relay. The relay connects the battery to the engine system. The TCU and the main fuel pump operate immediately. Pushing the ignition-starter key to START activates the starter relay and connects the battery to the starter. When the engine is running the rotating magnets generate voltage in the generator coils. The regulator limits the output voltage. A yellow warning light indicates failures of the generator system.

3.7.2.3 OVER VOLTAGE PROTECTION

The outputs of the belt driven alternator and of the internal generator are monitored by a dedicated over-voltage device OVP. The device senses the voltage of the related system and disconnects the related alternator resp. generator in the case of system voltages of more than 15.2 V.

Each OVP is located in the related distribution box. A yellow light at the box indicates a triggered over-voltage protection.

3.7.3 DC INDICATION (ATA 24-37-00)

3.7.3.1 DESCRIPTION

ach electrical system includes a voltmeter to indicate the system voltage and an ammeter to indicate the current between system and the connected battery.
The instruments can be toggled between the indication for the main and engine system by a selector switch.
The ammeter is supplied by shunts in the positive lines of the bateries.Positive reading indicates battery charging, negative reading indicates battery discharging.

A red warning light indicates failure of the main system alternator.
A yellow warning light indicates failure of the engine system generator.

Voltmeter, ammeter, selector switch and warning lights are located on the right hand part of the instrument panels and easy to read and to operate by the crew. Switch and warning lights are clearly labeled.

3.7.4 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Standard Installation		
Voltmeter	831120	UMA
Ammeter	831121	UMA
Shunt	831122	UMA
Integrated Modular Avionics (Optional)		
GARMIN G3X GDU 450 with GARMIN GEA 24 Engine Analyser	831711 831747	GARMIN
Shunt	831122	UMA

3.7.5 OPERATION

Use selector switch to choose indication of engine system voltage and current or main system voltage and current.

3.7.6 DC POWER DISTRIBUTION SYSTEM (ATA 24-60-00)

The system is designed to distribute electrical energy from the source to the electrical loads. Because the engine of the S12 is located in mid-fuselage, there are long distances between voltage sources and the loads.

Therefore, special attention is paid to subdivide the system into functional assemblies which includes sub-distributions with related protective devices.

3.7.6.1 WIRE SPECIFICATIONS

	Cross Section	Specification
Battery and Starter Cables	16 mm²	EN 50525-2-81
All other, unshielded and shielded	AWG 24…8	MIL-22579/16 or Raychem 44A

The cross section of each single wire is optimized individually.

The wires are bundled with spiral wrap to a wire harness. This harness is routed and fixed along the aircraft's steel tube frame from the electrical distribution rack to the instrument panel. Inside the cockpit, the wire bundle is routed along the tunnel between the seats.

Sufficient distance to moving parts and heat sources is provided. Mechanical damage by tight bending or chafing is prevented.

3.7.6.2 DESIGN OF ELECTRICAL CONNECTIONS

Electrical connections are made by screw terminals, push-on contacts or multiple position connectors.
Terminals and contact pins are generally crimped to the wires. Use of soldering techniques is minimized.
Terminals and connector systems meet industrial standards.

3.7.6.3 PROTECTION DEVICES

Fuses and circuit breakers of different industrial standards are used to protect each electrical circuit. The protective devices are rated according to the maximum allowed electrical load of the protected wire. Protection devices are located as close as possible to the voltage source to minimize the length of unprotected wire.

Fuses are grouped in fuse holders at different locations at the aircraft. The fuse holders are not reachable by the pilot in flight. Devices and circuits protected by fuse are considered as non-essential to safe flight. The loss of the related function caused by a blown fuse will not cause hazards to aircraft or crew. On the other hand, because of the fuse ratings there must be a severe reason for a blown fuse. It is considered improbable, that this could be corrected by the pilot by replacing a fuse in flight. A sufficient number of spare fuses is provided with the on-board tool set for a repair on ground.

The circuits of landing gear and electronic equipment are protected by resettable circuit breakers, located on the instrument panel and easy to reach by the crew in flight. This enables the pilot to evaluate the state of power supply of such devices in the case of malfunction. In addition, it allows the pilot to deactivate certain devices during gliding flight to save battery power (load shedding).

Each circuit breaker is clearly labeled with its function.

3.7.6.4 FUSE AND CB SPECIFICATIONS: MAIN SYSTEM

EFFECTIVITY S/N 12-001 - 12-025

Circuit	Location of Fuse/CB	Fuse/CB Rating (A)	STEMME p/n	Qualification
Main System Master Fuse	Main System Box	50	832247	ISO 8820-5
External Alternator				
Solar System	Fuse Holder Main System Box	10	831431	ISO 8820-3
ACL (Anti-collision light)		7.5	832319	
Position Lights		5	831430	
Landing Headlight				
Auxiliary Fuel Pump				
Ammeter Hi		2	831429	
Ammeter Lo				
COM	Instrument Panel Front	CB 5	832234	IEC 60934
EFIS				
Autopilot				
XPDR		CB 2	832232	
GPS				
Landing Gear System		CB 7.5	832235	LN 29886
Trim System	Fuse Holder Instrument Panel	5	831430	ISO 8820-3
Alternator Field				
Landing Gear Warning		2	831429	
Fire Warning				
Alternator Warning Light				
Volt/Ammeter				
Soaring Computer				
2nd Main System Battery (Oprtional)				
2nd Main System Battery Fuse	2nd Main Battery Container	40	831515	ISO8820-5

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EFFECTIVITY S/N 12-026 - 12-999

Circuit	Location of Fuse/CB	Fuse/CB Rating (A)	STEMME p/n	Qualification
Main System Master Fuse	Master Fuse Box	50	831727	ISO 8820-5
External Alternator	Steel Frame next to Alternator			
Instrument Panel Main Bus	Fuse Holder Main System Boc	15	831432	ISO 8820-3
Instrument Panel Avionics				
Solar System		10	831431	
ACL (Anti-collision light)		7.5	832319	
Position Lights		5	831430	
Landing Headlight				
Auxiliary Fuel Pump				
Ammeter Hi		2	831429	
Ammeter Lo				
COM	Instrument Panel Front	CB 5	832234	IEC 60934
EFIS				
Autopilot				
G3X PFD				
XPDR		CB 2	832232	
GPS				
G3X MFD				
Landing Gear		CB 7.5	832235	LN 29886
Trim System	Fuse Holder Instrument Panel	5	831430	ISO 8820-3
Alternator Field				
External Power Plug				
Landing Gear Warning		2	831429	
Fire Warning				
Alternator Warning Light				
Volt/Ammeter				
Soaring Computer				
2nd Main System Battery (Optional)				
2nd Main System Battery Fuse	2nd Main Battery Container	40	831515	ISO 8820-5

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3.7.6.5 FUSE SPECIFICATIONS: ENGINE SYSTEM

EFFECTIVITY S/N 12-001 - 12-025

Circuit	Location of Fuse/CB	Fuse/CB Rating (A)	STEMME p/n	Qualification
Starter	Engine System Box	80	831491	ISO 8820-5
External Power Supply				
System Master Fuse		50	831727	
Engine Bus Supply	Fuse Holder Engine System Box	15		ISO 8820-3
Internal Generator				
Prop Pitch Control Power				
Main Fuel Pump		5	831430	
TCU Power				
Fuel Transfer Pump RH				
Fuel Transfer Pump LH				
Internal Generator warning		2	831429	
Ammeter Hi				
Ammeter Lo				
Internal Generator	TCU Board	30	831446	ISO 8820-5
Starter Relay	Fuse Holder Instrument Panel	5	831430	ISO 8820-3
Fuel Flow Meter				
Propeller Pitch Indication		2	831429	
Low Fuel Warning Light				
Tachometer				
Ignition retarder				
Fuel Pressure Indicator				
Fuel Level Indicator LH				
Fuel Level Indicator RH				
Oil Press + CHT LH				
Oil Temp + CHT RH				
Volt/Ammeter				
Engine Hour Meter				
Prop Pitch Sense				

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EFFECTIVITY S/N 12-026 - 12-999

Circuit	Location of Fuse/CB	Fuse/CB Rating (A)	STEMME p/n	Qualification
Starter	Master Fuse Box	80	831728	ISO 8820-5
External Power Supply				
Internal Generator	Fuse Holder Engine System Box	30	831745	
Instrument Panel Engine Bus				
Prop Pitch Control Power		15	831432	
Main Fuel Pump		5	831430	ISO 8820-3
Fuel Transfer Pump LH				
Fuel Transfer Pump RH				
TCU Power				
Internal Generator Warning		2	831429	
Ammeter Hi				
Ammeter Lo				
Internal Generator	TCU Board	30	831446	ISO 8820-5
Starter Relay	Fuse Holder Instrument Panel	5	831430	ISO 8820-3
Fuel Flow Meter				
Propeller Pitch Indication		2	831429	
Low Fuel Warning Light				
Tachometer				
Ignition Retarder				
Fuel Pressure Indicator				
Fuel Level Indicator LH				
Fuel Level Indicator RH				
Oil Press + CHT LH				
Oil Temp + CHT RH				
Volt/Ammeter				
Engine Hour Meter				
Prop Pitch Sense				

3.7.7 SWITCHING DEVICES

Power switching devices are located as close as possible to the voltage source. Due to the distances between voltage source and cockpit, the most electrical loads are remotely controlled. With the manually operated toggle and rotary switches on the instrument panel the pilot controls the negative (ground) lines of control circuits of electro-mechanical or semiconductor relays, which are located on the electric distribution board. To minimize the voltage drop between power supply and load, the wiring of the load circuits is routed directly from distribution board to load device.

3.7.7.1 MANUAL SWITCHES

Manual switches are located on the instrument panel and easy to reach by the crew. The position of a toggle or rotary switch is indicated by the position of the operating lever or knob. The use of momentary switches or push-buttons is limited to certain functions of electronic equipment, as such electrical elevator trim, the PTT button of the communication radio, autopilot disengage and the remote control unit of the soaring computer.

Each switching element is sufficiently rated to carry the electrical load of the related circuit. None of the electrical circuits controlled by manual switches on the instrument panel has an electrical consumption of more than 3 A. Each switch is clearly labeled with its function.

Function	STEMME p/n	Electrical Load	Rating
Master Switch	10E-71	Relay Coil, < 1 A	3 A
Auxiliary Fuel Pump ON	10E-71	MOSFET Gate, < 0.1 A	3 A
Engine System Back-Up	10E-71	Relay Coil, < 1 A	3 A
TCU Emergency	10E-71	Relay Coil, < 1 A	3 A
Transfer Pump Selector	831507	Waste Gate Servo, < 2A	0.15 A
Landing Gear UP/DOWN	831225	MOSFET Gate, < 0.1 A	20 A
Ignition-Starter-Key-Switch	E24-20-001	Relay Coils, < 2 A	
Position Light Switch	10E-72	MOSFET Gate, < 0.1 A	3 A
ACL Switch	10E-72	MOSFET Gate, < 0.1 A	3 A
Landing Light	10E-72	MOSFET Gate, < 0.1 A	3 A
Propeller Pitch	10E-71	MOSFET Gate, < 0.1 A	3 A

3.7.7.2 ELECTROMECHANICAL RELAYS

Power relays are used as master relays for the main system and the engine system, as starter relay and as contactor for the optional ground power supply. The relays are typically ground-controlled, the control switch is connected to the negative side of the relay coil. This improves the system reliability.

Each relay is rated sufficiently for its electrical load.

Function	STEMME p/n	Rating	Fuse	Qualification
Main System Master	831416	70 A	50 A	
Engine System Master	831416	70 A	50 A	
Starter Relay	830725	75 A cont./300 A short time	80 A	Part of certified engine
Ground Power Relay	10ES-R01	75 A	80 A	

3.7.7.3 SEMICONDUCTOR SWITCH BOX

An 8-channel MOSFET-based switch box is installed to control the power for fuel pumps, lights and variable pitch propeller. The use of semiconductors improves the system reliability, reduces electromagnetic emissions and saves weight and space. The switch box is located close to the batteries and to the distribution boxes.

The box includes 8 channels with a switching capacity of max. 36 A each.

Connector	System	Channel #	Function	Fuse
Gray	Main	1	Position lights	5 A
		2	Anti-Collision Lights	5 A
		3	Landing Light	5 A
		4	Auxiliary Fuel Pump	5 A
Black	Engine	1	-spare-	
		2	Propeller Pitch Control	15 A
		3	Transfer Pump Left Wing	5 A
		4	Transfer Pump Right Wing	5 A

3.7.8 MAIN SYSTEM DISTRIBUTION BOX

3.7.8.1 MAIN SYSTEM DISTRIBUTION BOX (EFFECTIVITY S/N 12-001 - S/N 12-025)

This box includes a metallic bus bar to which the main system battery and the alternator are connected via master fuses. The main system master relay and a number of fuses are located in a combined fuse-relay-holder. The box is made of plastic with a sealed cover and is mounted on a rack on the aft area of upper fire wall.

See figure 3.7.9.1.a " Electrical Components Center Fuselage (Effectivity S/N 12-001 – S/N 12-025)" for the installation location.

3.7.8.2 MAIN SYSTEM DISTRIBUTION BOX (EFFECTIVITY S/N 12-026 - S/N 12-999)

The main system section in the electric distributor includes a metallic bus bar to which the main system battery and the alternator are connected. The main system master relay and a number of fuses are located in a combined fuse-relay-holder. The box is made of plastic with a dust cover and is mounted on a rack on the aft area of upper fire wall. The main system battery fuse installed in the Master Fuse Box on the same rack.

See figure 3.7.9.2.a " Electrical Components Center Fuselage (Effectivity S/N 12-026 – S/N 12-999)" for the installation location

3.7.14 ENGINE RPM INDICATING SYSTEM (ATA 77-14-00)

3.7.14.1 DESCRIPTION

The RPM signal is delivered by a pick-up coil at the rotating magnets of the internal generator to the tachometer input of the Turbocharger Control Unit (TCU). The TCU provides an output to which the electrical tachometer on the instrument panel (Standard) or the GARMIN GEA 24 (Optional) is connected. The tachometer system is wired with shielded AWG22 wire.
The analog tachometer fuse is located at the instrument panel fuse holder (engine bus).
The digital RPM indicating system (Optional) is fused via the integrated Modular Avionics.

The RPM signal is secondarily used to trigger a frequency relay which activates the field circuit for the belt-driven alternator.

3.7.14.2 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Standard Installation:		
Revolution Counter	150035	STEMME
Trigger Coil Assy. (RPM-Sensor)	--	ROTAX (see ROTAX IPC)
Integrated Modular Avionics (Optional):		
Revolution Counter	---	GARMIN (included in GDU)
Adaptation Kit Garmin for ROTAX	831762	Garmin
Trigger Coil Assy. (RPM-Sensor)	R264087	ROTAX (see ROTAX IPC)

3.7.14.3 OPERATION

The engine RPM indicating system does not require operation actions by the pilot.

3.7.15 CYLINDER HEAD TEMPERATURE INDICATING SYSTEM (ATA 77-22-00)

3.7.15.1 DESCRIPTION

The CHT indicating system measures the cooling water temperature on two of the four cylinder heads of the ROTAX 914 engine. The temperature signal is generated by resistive type probes (Pt-100 characteristics) and displayed to the pilot by one pointer-style gauge for each side of the engine (Standard) or within the integrated modular avionics (Optional).
The indicators share their fuses with the oil temperature resp. pressure indicator. The fuses are located at the instrument panel fuse holder (engine bus).

3.7.15.2 PPARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Standard Installation:		
Oil Temperature Indicator	831241	UMA (TSO)
Temperature probe RTD (Resistance Temperature Detector)	831243	UMA
Integrated Modular Avionics (Optional):		
Oil Temperature Indicator	--	GARMIN (included in GDU)
Temperature probe	R965531	ROTAX (see ROTAX IPC)

3.7.15.3 OPERATION

The CHT Indication system does not require operation actions by the pilot. Scale markings of operational limits and instructions to the pilot about corrective actions in the case of exceeded limits are defined in the S12 AFM.

3.7.16 OIL PRESSURE INDICATING SYSTEM (ATA 79-31-00)

3.7.16.1 DESCRIPTION

The oil pressure indicating system measures the pressure at the output of the mechanical oil pump of the ROTAX 914 engine. A transducer generates a voltage of 0...5 V proportional to the pressure. This voltage is displayed to the pilot by a pointer-style gauge.

The indicator shares a fuse with the CHT-left indicator. The fuse is located at the instrument panel fuse holder (engine bus).

3.7.16.2 PPARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Pressure Sender	831116	UMA
Standard Installation:		
Oil Pressure Indicator	831115	UMA (TSO)
Integrated Modular Avionics (Optional):		
Oil Pressure Indicator	--	GARMIN (included in GDU)

3.7.16.3 OPERATION

The Oil Pressure Indication system does not require operation actions by the pilot. Scale markings of operational limits and instructions to the pilot about corrective actions in the case of exceeded limits are defined in the AFM.

3.7.17 OIL TEMPERATURE INDICATING SYSTEM (ATA 79-33-00)

3.7.17.1 DESCRIPTION

The oil temperature indicating system measures the oil temperature in the crankcase of the ROTAX 914 engine. The temperature signal is generated by a resistive type probe (Pt-100 characteristics) and displayed to the pilot by a pointer-style gauge.
The indicator shares a fuse with the CHT-right indicator. The fuse is located at the instrument panel fuse holder (engine bus).

3.7.17.2 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Temperature probe RTD (Resistance Temperature Detector)	831243	UMA
Standard Installation:		
Oil Temperature Indicator	831241	UMA (TSO)
Integrated Modular Avionics (Optional):		
Oil Temperature Indicator	--	GARMIN (included in GDU)

3.7.17.3 OPERATION

The oil temperature indication system does not require operation actions by the pilot. Scale markings of operational limits and instructions to the pilot about corrective actions in the case of exceeded limits are defined in the AFM.

3.7.18 FUEL DISTRIBUTION SYSTEM (ATA 28-20-00)

3.7.18.1 DESCRIPTION

The fuel is stored in two wing tanks of equal size, one in each side of the wing center section. Each tank is vented to the atmosphere to prevent overpressure or vacuum situations. Each tank has an over wing fuel filler. Each tank is connected via a coarse filter and quick drain to a dedicated electric plunger pump with downstream check valves. These check valves close off the fuel line when the pumps are not powered. The transfer pumps deliver the fuel into the feeder tank. The fuel line between check valves and feeder tank includes a quick-disconnect to facilitate handling during wing rigging and de-rigging.
The feeder tank incorporates two float switches to control the transfer pumps and to generate a low fuel warning signal to the pilot. From the feeder tank the fuel is delivered by a turbine pump (feeder pump) to the fuel pressure regulator, which provides the required fuel pressure to the carburetors. The regulator's return line ends in the feeder tank.
The feeder pump is backed up by another turbine pump of the same type.

3.7.18.2 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Main and Auxiliary Feeder Pump	11AB-M02	Pierburg
Fuel Transfer Pumps	830521	

3.7.18.3 OPERATION

a) Main Feeder Pump Control

The main feeder pump is supplied by the engine's electrical system. It automatically starts to work when the engine's electrical system is activated by the pilot. Proper operation of the main feeder pump is indicated by the fuel pressure indicating system (refer 28-44-00). The electrical power line of the main feeder pump is protected by a fuse located inside the engine system junction box (refer 24-60-00).

b) Auxiliary Feeder Pump Control

The auxiliary feeder pump is controlled by a switch to be manually activated by the pilot when required. To achieve better redundancy of the fuel system, the auxiliary feeder pump is powered by the main electrical system, independently from the engine's electrical system. The proper function of the auxiliary feeder pump is indicated by a green light and by the fuel pressure indicating system (ref 28-44-00). The electrical power line of the auxiliary feeder pump is protected by a fuse located inside the main system junction box (refer 24-60-00).

3.7.18.4 TRANSFER PUMP CONTROL AND TANK SELECTION

The transfer pumps are powered by the engine electrical system. They transfer pumps are controlled by a float switch in the feeder tank and by a pump selector switch. At feeder tank fuel levels below 90% the transfer pump control is active. The pilot selects the pump on a rotary switch with the positions LEFT-BOTH-RIGHT. Due to the check valves downstream from the transfer pumps, the related tank outlet will be closed off completely when the associated transfer pump is not powered. Thus the pump selector switch functions as a tank selector.

The selected transfer pump/pumps stops automatically when the fuel level reaches 90% in the feeder tank. On feeder tank-fuel level below 90% the selected transfer pump/pumps start automatically.

The transfer pumps can be activated manually by a test push-button in the cockpit center console when the Master Switch is ON. This function is used for daily inspection or Maintenance Tasks. The transfer pump/pumps to be tested can be selected by using the fuel selector switch (Left, Right, Both).

3.7.19 FUEL QUANTITY INDICATION (ATA 28-40-00)

3.7.19.1 DESCRIPTION

A float type fuel level sender is installed in each fuel tank in the wing. The electrical resistance of the sender changes depending on the float position. This resistance is measured and displayed to the pilot on one pointer-type fuel level indicator for each tank (Standard) or as digital values for each tank within the integrated modular avionics.
The indicator scale is marked with lines, each representing one eighth of full.

A separate float type switch is installed in the feeder tank which activates a yellow low fuel warning light on the instrument panel at feeder tank fuel levels below ca. 2.5 ltr.
The fuses for the fuel level indicator system are located in the instrument panel fuse holder (engine bus).

3.7.19.2 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Fuel Level Sender	124411	STEMME
Float Switch	831087	--
Standard Installation:		
Fuel Quantity Indicator	831435	UMA (TSO)
Integrated Modular Avionics		
Fuel Quantity Indicator	--	GARMIN (included in GDU)

3.7.19.3 OPERATION

The fuel quantity indication system does not require any operation actions by the pilot.
Instructions to the pilot in case of low fuel level situation can be found in the AFM.

3.7.20 FUEL PRESSURE INDICATING (ATA 73-32-00)

3.7.20.1 DESCRIPTION

The ROTAX 914 engine requires the measurement of fuel pressure in relation to the “upper deck” air pressure of the turbocharger system. Therefore a differential pressure sender is installed which generates a voltage output of 0 V ... 5 V proportional to the difference between regulated fuel pressure and air box pressure. This voltage is displayed to the pilot on a dedicated digital voltmeter in the engine portion of instrument panel.
The operational range of 150 mbar ... 350 mbar is marked on a placard close to the voltmeter.

On the Integrated Modular Avionics (Optional) the fuel pressure will be displayed as digital value.

The fuse for the fuel pressure indicator system is located in the instrument panel junction box (engine bus).

3.7.20.2 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER
Differential Pressure Sensor	E64-30-002	UMA
Standard Installation:		
Indicator	831147	Conrad
Integrated Modular Avionics (Optional):		
Indicator	--	GARMIN (included in GDU)

3.7.20.3 OPERATION

If the fuel pressure exceeds the limits, the pilot has to check the available amount of fuel and the state of the tank selector and the auxiliary fuel pump. Instructions about appropriate corrective actions are included in the S12 Aircraft Flight Manual.

3.7.21 FIRE DETECTION SYSTEM (ATA 26-12-00)

3.7.21.1 DESCRIPTION

Two bimetallic thermal switches are positioned on the upper firewall directly above the carburetors to detect increasing temperatures. At temperatures above 160°C the switches (or at least one) open the control circuit of a relay. This activates a red warning light and a piezo signal horn. The system includes a test switch on the panel.

3.7.21.2 PARTS SPECIFICATION

PART	STEMME P/N	MANUFACTURER P/N
Thermo switch Microtherm R20	10AM-F01	various
Switch with indication light - housing	10AM-F02	various
Switch with indication light - cap	10AM-F03	various
Switch with indication light - bulb	10AM-F04	various

3.12 2ND MAIN SYSTEM BATTERY

The Stemme S12 can be equipped optionally with a portable 2nd main system battery in the rear baggage compartment.

The battery is stored in a fibre reinforced battery container and can be easily fixed with quick release locks at the fuselage structure within the rear baggage compartment.

NOTICE

A description of the function and its operation can be found in the associated supplement to the S12 Aircraft Flight Manual.

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OXYGEN EQUIPMENT

Type and Subject of Inspection	Break-in	Aircraft 100 hr	Engine 100 hr	Engine 200 hr	Engine 600 hr	Engine 2000 hr	Annual	Refer to Section	Sign-off
1. Check oxygen equipment if installed. Observe maintenance instructions of manufacturer. (Refer to Annex A)		x					x	7.9	

2ND MAIN SYSTEM BATTERY

Type and Subject of Inspection	Break-in	Aircraft 100 hr	Engine 100 hr	Engine 200 hr	Engine 600 hr	Engine 2000 hr	Annual	Refer to Section	Sign-off
1. Check the battery container for structural integrity.		x					x		
2. Maintain the battery in accordance with maintenance instructions of manufacturer. (Refer to Annex A).		x					x		
3. Check the electrical connectors on the battery box and in the fuselage.		x					x		
4. Check the proper function of the mechanical locks of the battery container during installation into the aircraft.		x					x		

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5.5.4 APPROVAL OF SOFTWARE LEVELS OF AUTOPILOT SYSTEMS

This sub-chapter is only applicable for aircrafts with an installed automatic pilot system.

Firmware related to the function of automatic pilot systems must be approved by the aircraft's TC holder.

The firmware of the following devices must comply with the list of approved software levels issued by the aircraft's TC holder:

System: Dynon EFIS-D10A with Autopilot		
Device	Function	List of approved software levels
DYNON EFIS-D10A	Busmaster	Issued with STEMME Service Bulletin: P062-980004, latest revision
DYNON EFIS-D10A	Magnetometer	
DYNON AP74	Autopilot Control Panel	
DYNON SV42	Pitch Servo	
DYNON SV52	Roll Servo	
Various GPS receivers	NAV-Source	

System: Garmin G3X Touch System with Autopilot		
Device	Function	List of approved software levels
GARMIN GDU 450/455	Autopilot Control Panel	Issued with STEMME Service Bulletin: P062-980024, latest revision

In case of the TC holder issuing a service bulletin related to an automatic pilot software level, the software level of the installed automatic pilot system must be determined and compared to the list of the approved software levels given in the service bulletin.

If the software level of the automatic pilot system is not or no longer approved an update of the autopilot software must be performed.

For guidance to determine the current autopilot software level and to perform an update refer to Annex A of this manual:

Garmin G3X Touch automatic pilot systems:
Doc.-No. P320-901967 – Adjustment Instruction Garmin G3X Touch

Dynon EFIS-D10A automatic pilot systems:
Doc.-No. P320-901968 – Adjustment Instruction Dynon EFIS-D10A

5.5.5 LUBRICATION IGNITION-STARTER-SWITCH

The ignition / starter system of the Stemme S12 includes an ignition starter switch manufactured by ACS Products.
The manufacturer has been published a Service Bulletin SB92-01 Rev D on 18 November 2008.

This service bulletin intrduce a modification in the wiring of the starter circuit of the affected aircrafts and it introduce an additional maintenance task:

Inspection and Lubrication of the Ignition-Starter-Switch after 2000h of operation.

The modification of the wiring in the starter circuit is not applicable for the Stemme S12.

The maintenance task will be taken over for the Stemme S12.

7.7 ELECTRICAL SYSTEM

Description: See section »3.7« and »Maintenance Manual (Line Maintenance) for ROTAX Engine Type 914 Series« (Annex E).

7.7.1 GENERAL

- Check wiring of entire electric system (observe section »5.2.4«). Specially check cable routing for sufficient supports, for chafing in the area of penetrations of cable (e. g. firewall) and for signs of overheating.
- Check condition of CB's, replace if required.
- Check any electrical device and all switches for proper installation, tight fit and proper cable connections.
- Check electrical switches in the cockpit for intended function. Perform this check during an engine test run, refer to section »7.4.1.17«.

REGULATOR VOLTAGE

Average:	13.75 V
Maximum:	14.20 V

The values indicated are valid for the engine bus with internal generator and main bus with external, belt driven, alternator.

7.7.2 BATTERIES

- Check the standard main system battery and the engine battery at the forward tail cone for its proper condition (contacts, state of charge, etc.).
- Check mounting assembly of batteries at the forward tail cone.

Optional:

- Check the 2nd main system battery in the rear baggage compartment for its proper condition (connector plug, contacts, state of charge, etc.).

NOTICE

Approximated 2 Volts drop of a full charged new engine battery at 15° C / 59°F during starter operation.

For maintenance on the batteries, please refer to the Manufacturer's Instructions (Annex A).

⚠ WARNING

If battery energy is not required for test purposes during any maintenance on the electrical system, the negative connection to the battery should be disconnected.
To remove the battery, disconnect the negative cable first. To install the battery, connect the positive cable first, then connect the negative.
The engine must never be started from the auxiliary, external electrical power receptacle (if installed) without the battery installed.

7.7.3 GROUNDING

- Check condition of cables and connections and tight fit of main grounding cable: Battery to engine suspension frame and grounding cable on LH engine suspension shock mount.
- Check condition of cables and connections and tight fit of grounding cables on fuel pumps.

7.7.4 E-BOXES

- Check condition of electric distribution box assy. on rear fuselage steel frame.
- Check tight fit of connections, tight fit of auxiliaries (capacitor, regulator) and fuses.
- Open E-boxes and check cables, connections and components for damage, fastening, foreign objects and moisture.

7.9 OPTIONAL - OXYGEN EQUIPMENT

Description: See section »3.10«

OXYGEN SYSTEM MOUNTING

- Check the oxygen system mounting, if installed as optional equipment, for condition and tight fit of components.

OXYGEN SYSTEM

Perform maintenance on the oxygen system in accordance with the instructions of the manufacturer (see Annex A).

7.10 OPTIONAL - WING FOLDING DEVICE

Description: See section »3.11«

⚠ CAUTION

Never use grease for the maintenance of operation sliding areas.

DISASSEMBLING

- For disassembling the outer wing follow up the sequence given in the AFMS section 4 until the access to the connection bolt of folding device is given.
- Unscrew the connection bolt of the wing folding device between inner wing and outer wing.
- Remove the outer wing from the aircraft.

MAINTENANCE OUTER WING PARTS

- If necessary the outer wing parts can be disassembled from the outer wing rib by unsrewing the 4 self-locking nuts.

NOTICE

Mark the direction of the installation a permanent marker. Maintain both installations in sequence to avoid an interchange of the installation place. RH and LH-parts are marked for its correct use.

- Clean the swivel part at the outer wings, if necessary unscrew both slotted screws for guiding the swivel part into the mounting bracket.
- Use “dry Teflon” to maintain the installed GLYCODUR bushings.

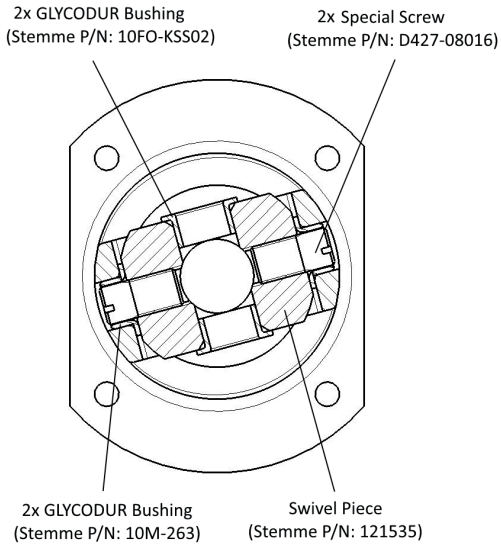

Figure 7.10.a
Swivel Installation

7.11 OPTIONAL - 2ND MAIN SYSTEM BATTERY

Description: See section »3.12«

NOTICE

The 2nd main system battery is maintenance free.

⚠ CAUTION

Batteries should be carefully inspected on a regular basis in order to detect and correct potential problems before they can do harm.

REPLACEMENT OF THE BATTERY

- MASTER SWITCH: OFF.
- Battery Selector Switch: Switch to 1st Main System Battery (Standard).
- Disconnect the 2nd main system battery from the aircraft system.
- Remove the 2nd main system battery container from the fuselage.
- Open the upper container cover.
- Disconnect the wiring from the battery poles.
- Remove the battery.
- Check the inside condition of the battery container.
- Fit the new battery into the container.
- Connect the wiring in correct order.
- Close the upper container cover - Tighten the slotted screws carefully.

NOTICE

It is recommended to charge the new battery first time outside the aircraft with a suitable battery charger.

- Install the 2nd main system battery in the rear baggage compartment.
- Check the proper fit of the locking devices.
- Connect the battery to the aircraft system.

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