

Burkhart Grob Luft- und Raumfahrt  
GmbH & Co. KG, D-8939 Mattsies

G 103 C TWIN III SL

MAINTENANCE MANUAL

No.	Qty.	Name	Part No.	No.	Qty.	Name	Part No.
4	1	Plate	103SL-6400.04	133	1	Hex Head Screw	1/2"-20UNFX30
5	1	Bracket	103SL-6400.05	138	2	Screw	DIN912-M12x30-12.9
6	1	Washer	103SL-6400.06	139	4	Screw	LN9037-M4x16
7	1	Sleeve	103SL-6400.07	140	8	Screw	DIN912-M8x25
8	1	Sleeve	103SL-6400.08	142	1	Screw	DIN7991-M4x10
9	2	Spacer	103SL-6400.09	143	2	Screw	DIN7991-M5x25
11	1	Grooved Nut	103SL-6400.11	144	2	Screw	DIN912-M12x80-12.9
12	1	Securing Plate	103SL-6400.12	145	2	Screw	DIN912-M8x25
13	1	Supporting Plate	103SL-6400.13	146	11	Screw	DIN912-M8x12
22	1	Starter Plate	103SL-6400.22	147	1	Screw	LN9037-M4x10
24	1	Bracket	103SL-6400.24	148	2	Screw	LN9037-M6x20
26	2	Tube	103SL-6400.26	149	8	Screw	LN9037-M5x16
27	1	Bolt	103SL-6400.27	150	6	Washer	LN9025-8,4
28	1	Screw	103SL-6400.28	151	2	Washer	LN9025-6,4
53	1	Spring	103SL-6453	152	6	Washer	LN9025-4,3
60	1	Bracket	103SL-6460	153	2	Washer	DIN9021-4,3
66	1	Tekalmit-tube	103SL-6400.66	154	2	Washer	LN9025-12,4
69	1	Brake Unit	103SL-6971	155		Washer	DIN988-12x18... if required 0.2; 0.5; 1
71	1	Cable Attachment Bracket LH	103SL-6471				LN9025-5,3
72	1	Cable Attachment Bracket RH	103SL-6472	156	2	Washer	LN9025-5,3
80	1	Bracket	103SL-6480	157	7	Washer	DIN9021-5,3
110	1	Engine Mount	103SL-6410	158	7	Washer	LN9348-M6
111	1	Starter Motor	103SL-6420	160	4	Nut	LN9348-M4
112	1	Upper Tooth Pulley Wheels Assy	103SL-6430	161	8	Nut	M6-14
113	1	Lower Tooth Pulley Wheels Assy	103SL-6440	162	3	Rivet Nut	LN9343-M5
114	1	Lever	103SL-6450	163	10	Nut	DIN4060-DM40
115	1	Carburator LH	103SL-6421	164	1	Rubber Ring	RGK8
116	1	Carburator RH	103SL-6422	165	1	Clamp	242
118	1	Exhaust System	103SL-6600	171		Loctite	
120	1	Engine	Rotax 505A				
121	2	Air Filter	RU-26-90				
122	2	Filter stub	PartNo. 2074585				
129	1	Toothed Belt	Poly Chain GT 8M-800-50 wide				
130	2	Ball Thrust Bearing	7008.BE2RS5				
132	1	Mikuni-Pump	PartNo. 994 482				

- Bowden Cables and their Holders:

• **only for variable pitch propeller:**

Disconnect the ball head from the bracket of the variable pitch propeller. If necessary, carefully bend open the Bowden cable guide on the engine block and remove the Bowden cable from the U-shaped bracket. Under no circumstances remove the Bowden cable completely!

Slacken screw and nut on the pulleys and remove the Bowden cable from the clip.

Under no circumstances remove the pulleys!

Remove screw and nut from the thimble of the Bowden cable for the engine brake.

Remove the screw on the bracket and remove the bracket complete with attached Bowden cable.

• **only for variable pitch propeller:**

Disconnect the Bowden cable from the detent of the variable pitch propeller. Under no circumstances remove the Bowden cable as a complete unit!

• Disconnect the power and choke cables from the engine.

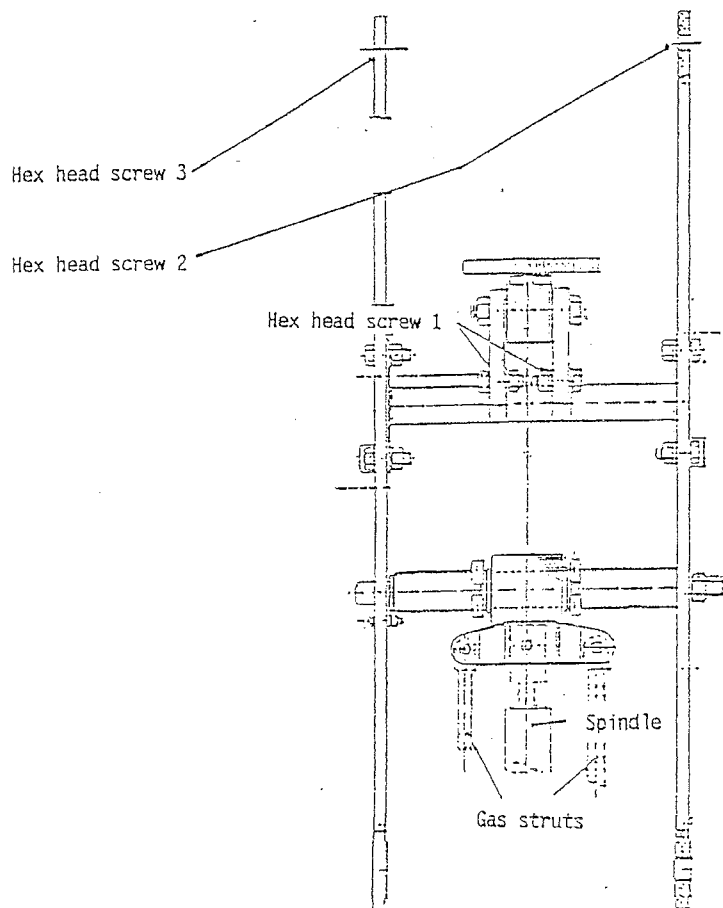
Remove the screws and nuts from the clips. Under no circumstances remove the complete Bowden cables!

- When the above work has been completed, remove the engine from the two engine supports. The procedure for this is described below:

- Remove the mounting plate for the power and choke cables.
- Remove the front air filter from the carburetor.
- Disconnect the fuel line from the diaphragm pump.
- Remove the arrestor cables from the supports.  
Slacken the screw and nut on the thimble.
- Remove screws (1) and nuts from the engine supports.  
The complete ignition box remains installed on the engine.
- Remove screw (2) and (3) on the engine supports.
- Lift the engine out of the supports.

**Warning:** It is of absolute importance that the removal of screws (2) and (3) is left to the last step (after removal of the screws (1)). If this warning is not observed the engine will pivot sharply about the spindle axis.

Engine Supports



- Installation

Install the engine in the reverse order. There are no special torque values specified for the screws. Always use new stop nuts.

General Overhaul

If necessary, additional procedures will be established for removal and installation of the engine for the purpose of a general overhaul (see Sec. 4.2.3)

6.7 Removal and Installation of the Propeller

6.7.1 Variable Pitch Propeller

- Removal

Before removing the variable pitch propeller, remove the engine exhaust. To remove the variable pitch propeller MTV-24-M/158-16 from the engine, remove the six M8 stop nuts and plain washers.

- Installation

Install the propeller in the reverse order. The six stop nuts must be torque loaded to 18 - 20 Nm (13.2 - 14.7 lb.ft) (the threads must be clean and grease-free).

6.7.2 Fixed Pitch Propeller

- Removal

To remove the fixed pitch propeller KS-1C-158-R-108 from the engine, remove the six M8 screws and plain washers.

- Installation

Install the propeller in the reverse order.

**Caution:** When installing the propeller the index lever must be in the detent position and the propeller positioned vertically on the shaft. The propeller flange cover must be installed on the propeller with the chamfer facing outwards.

Tighten the six screws (clean, grease-free threads) to 18 - 20 Nm (13.2 - 14.7 lb.ft), and lock with 0.8 mm dia. safety wire.

6.8 Removal and Installation of the Pulley Wheels

Two pulley wheels are used:

- the upper pulley wheel is attached to the propeller shaft
- the lower wheel (drive pulley) is attached to the engine crankshaft.

Before removing the pulley wheels, remove the propeller.

- Lower Pulley Wheel

• Removal

To remove the drive pulley (lower wheel), remove the screw and washer and use a puller to remove the pulley from the crankshaft.

• Installation

Install the drive pulley in the reverse order. The ROTAX supplied screw must be torqued to 50 Nm (36.9 lb.ft) .

- Upper Pulley Wheel

• Removal

- Remove propeller (refer to Section 6.7)
- Remove lower pulley wheel and toothed belt
- Bend up both teeth from securing plate and loosen grooved nut

Note: Grooved nut has left hand thread !

- Remove upper pulley wheel and supporting plate

Note: It is recommended to heat up carefully the propeller flange, because the bearings of the upper pulley wheel are fixed with LOCTITE 222E.

• Installation

- Clean all parts (especially propeller flange, pulley wheel and inner bearing races) prior to reassembling, and check for damage and excessive wear.
- Install supporting plate (pay attention for the direction of installation!)
- Apply LOCTITE 222E to propeller flange and install upper pulley wheel
- Install securing plate and tighten grooved nut to 20 Nm (14.7 lb.ft)
- Fit two opposed teeth of the securing plate to the grooves of the grooved nut. Secure grooved nut using securing paint.

Note: Each tooth of the securing plate may be bended only once. Then the securing plate must be replaced. Pay attention to a permanent proper condition of the securing plate.

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### 6.9 Removal and Installation of the Toothed Belt

Removal and installation of the toothed belt should be performed according to the Grob Process Specification "Assembly of the Toothed Belts" GPS 103SL-602. This document is available from GROB on request.

### 6.10 Removal and Installation of the Spindle Drive Assembly

The spindle drive assembly consists of an electric motor, a bevel gear drive and a spindle. The operation of the spindle drive is assisted by two gas struts.

The spindle drive assembly will be exchanged only in total. The gas struts can be changed by removing the nuts from both connections to the spindle drive. Note that the struts must be completely unloaded before they are disconnected from the spindle drive.

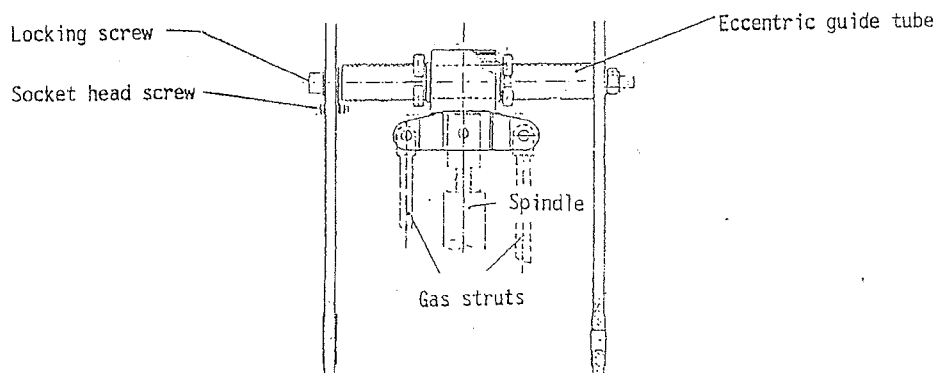
**Note:** Use new stop nuts when the gas struts are re-installed.

#### - Removal

Before starting to remove the spindle drive, fully extend the engine and support it in such a way that it cannot be retracted by accident.

**Warning:** When the spindle drive is removed, the engine is only supported at one point. The engine and its supports together weigh approximately 55 kg (121 lb). Support the engine properly to prevent it from retracting.

- Disconnect the electrical connections from the distribution link on the engine compartment rear bulkhead.
- Remove the screw and nut from the bearing bracket on the fuselage floor.
- Remove the socket head screw and the nut from each swivel bearing of the engine support.
- Remove the locking screw and nut from the eccentric guide tube.
  - The eccentric guide tube could be released by removing the two clamps from the complete spindle drive assembly.
- Remove the complete spindle drive assembly from the aircraft.



- **Installation**

Install the spindle drive assembly in the reverse order.

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7. Determination of the Center of Gravity Position and the Payload

7.1 Introduction

This section covers methods for determining the empty mass, the empty mass center of gravity (c.g.) position, the flying mass and the flying mass c.g. position of the motorglider.

Furthermore, methods for determining c.g. positions and the payload are provided.

A list of available equipment can be found in Section 8.

7.2 Weighing Procedure

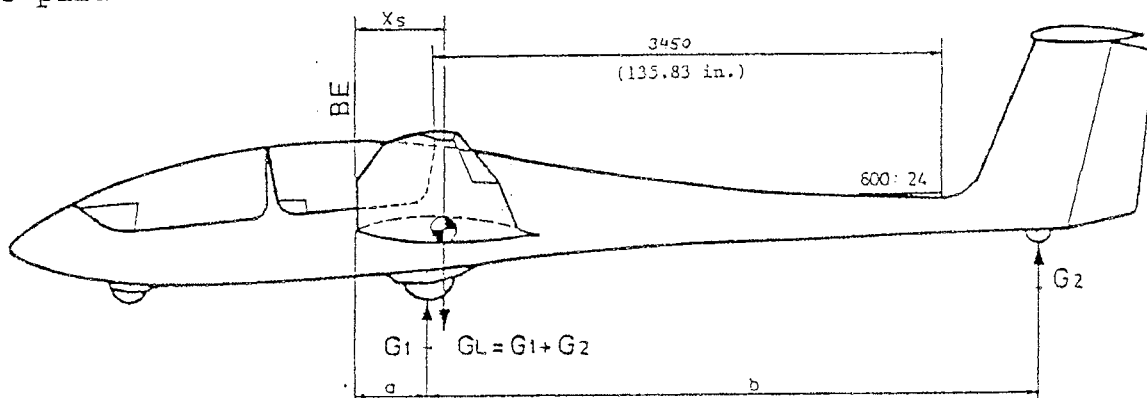
Determination of the Empty Mass Center of Gravity

To determine the c.g. the motorglider is placed on two scales so that the upper side of an incidence board (600:24) (located on the fuselage top) is horizontal.

The datum (BE) is at the wing leading edge at the root rib. The distances a and b are determined by dropping a perpendicular (plumb line). The empty mass is the total of the masses  $G_1$  and  $G_2$ .

For weighing, the motorglider must be in the following condition:

- completely rigged and placed in flight attitude
- equipment in accordance with the equipment list
- flight log and Pilot's Operating Handbook on board
- canopies closed, engine retracted
- no removable ballast (trim weights) on board
- no parachutes on board



Datum (BE) : Wing leading edge at the root rib  
Glider attitude: Incidence board 600:24 on the fuselage top in front of the vertical stabilizer

Mass on main wheel	$G_1 =$	kg (lbs)
Mass on tail wheel	$G_2 =$	kg (lbs)
Empty Mass	$G_L = G_1 + G_2$	kg (lbs)
Distance to main wheel	$a =$	mm (in)
Distance to tail wheel	$b =$	mm (in)

Empty Mass Center of Gravity

$$X_{EMPTY} = \frac{G_2 * b}{G_L} + a = \text{mm (in) aft of datum (BE)}$$

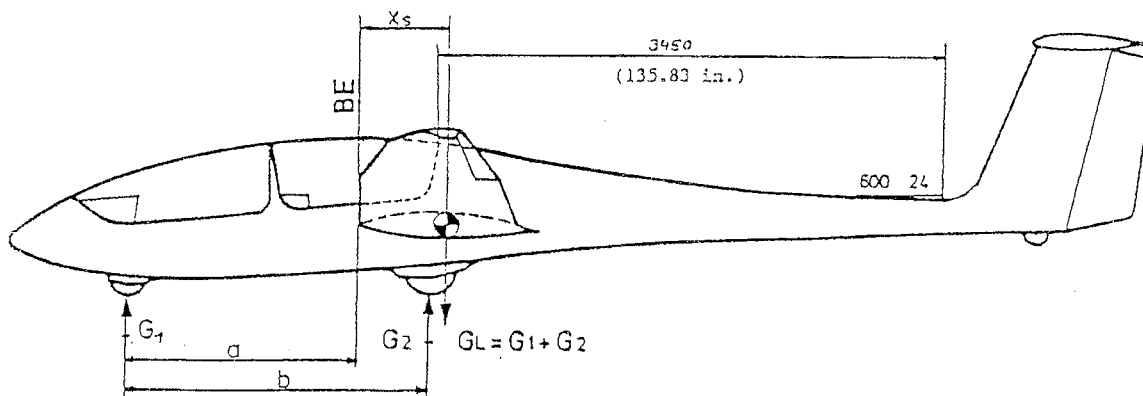
Determination of the Flying Mass Center of Gravity

Place the motorglider with its nose and main wheel on two scales so that the upper side of an incidence board (600:24) (located on the fuselage top) is horizontal.

For weighing, the motorglider must be in the following condition:

- as described under Determination of the Empty Mass c.g. but including:
- the pilot(s)
- the parachute(s)
- any installed ballast (trim weights)
- the entire equipment such as barograph, cushions, cameras etc.

Pay attention to the correct setting of the rudder pedals.



Flying Mass Center of Gravity

$$X_{\text{FLIGHT}} = \frac{G_2 * b}{G_L} - a = \quad \text{mm (in) aft of datum (BE)}$$

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7.3 Weight and Balance Report

BURKHART GROB  
LUFT- UND RAUMFAHRT GmbH & Co. KG  
Postfach 12 57  
Am Flugplatz  
8939 Mattsies  
LBA Nr. I-B 21

WEIGHT AND BALANCE REPORT

Model:	Registration-No.:	Serial-No.:
Datum Line (B. P.):	Leading edge of the wing at the root	
Level Means (B. L.):	Incidence board 600 : 24 mm on top of the rear fuselage	
<u>Weighing:</u>	Empty weight	Weight of non lifting parts
Wing right		Weight Limits:
		Empty weight
		Maximum payload
Wing left (with wing tank)		Maximum gross weight
Fuselage incl. rudder and canopy and standard equipment		Maximum permitted weight of non lifting parts acc. to Type Cert. Data Sheet
Tailplane		Partition of payload see instructions in Flight Manual!
Payload		Remarks:
Result		

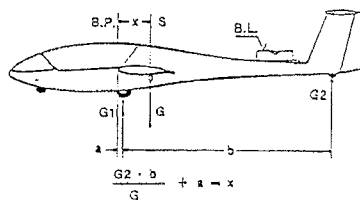
C. G. Determination:

Weighing point	Gross	Tare	Net	Moment arm
front G 1				a =
rear G 2				b =

Empty weight \_\_\_\_\_

Weighing conditions:

- Powerplant retracted
- without fuel (both tanks empty)
- Battery I, 26 Ah, 9,8 kg in the front instrument panel
- Battery II, 9,3 kg, beneath baggage compartment
- Instruments and equipment refer to the Equipment List page 1 to \_\_\_\_\_ dated \_\_\_\_\_



$$\frac{G2 \cdot b}{G} + a = x$$

Empty weight center of gravity (EWCG): \_\_\_\_\_

aft of datum (B. P.) \_\_\_\_\_

C. G. -range acc. flight manual from \_\_\_\_\_ upto \_\_\_\_\_

at empty weight \_\_\_\_\_

The determined empty weight C. G. is within the limits.

Equipment by weighing see equipment list of \_\_\_\_\_

Date \_\_\_\_\_

Signature of authorized individual \_\_\_\_\_

#### 7.4 Weighing Record

The empty mass center of gravity must be determined:

- if additional equipment has been installed
- if the motorglider has been freshly painted
- after repairs or other alterations which might alter the motorglider's mass
- at least every four years

A weight and balance report must be established and attached to the motorglider's life records.

After the motorglider has been weighed, the empty mass, the payload (in the seats and baggage compartment) and the empty mass c.g. (with reference to the equipment list) must be entered into the weighing record (see Pilot's Operating Handbook Section 6.2, Page 6.4) and signed by an authorized inspector.

#### 7.5 Empty Mass and Empty Mass Center of Gravity Position

The empty mass of the motorglider is the mass:

- excluding the pilots
- excluding the parachutes
- including the entire equipment according to the equipment list
  
- Empty Mass Center of Gravity

With the empty mass c.g. within the range listed below and the pilots' weights in accordance with the weight and balance placard inside the cockpit, then the flying mass c.g. is within the permissible range.

Because the center of gravity position greatly influences flight safety the above limits must be strictly observed.

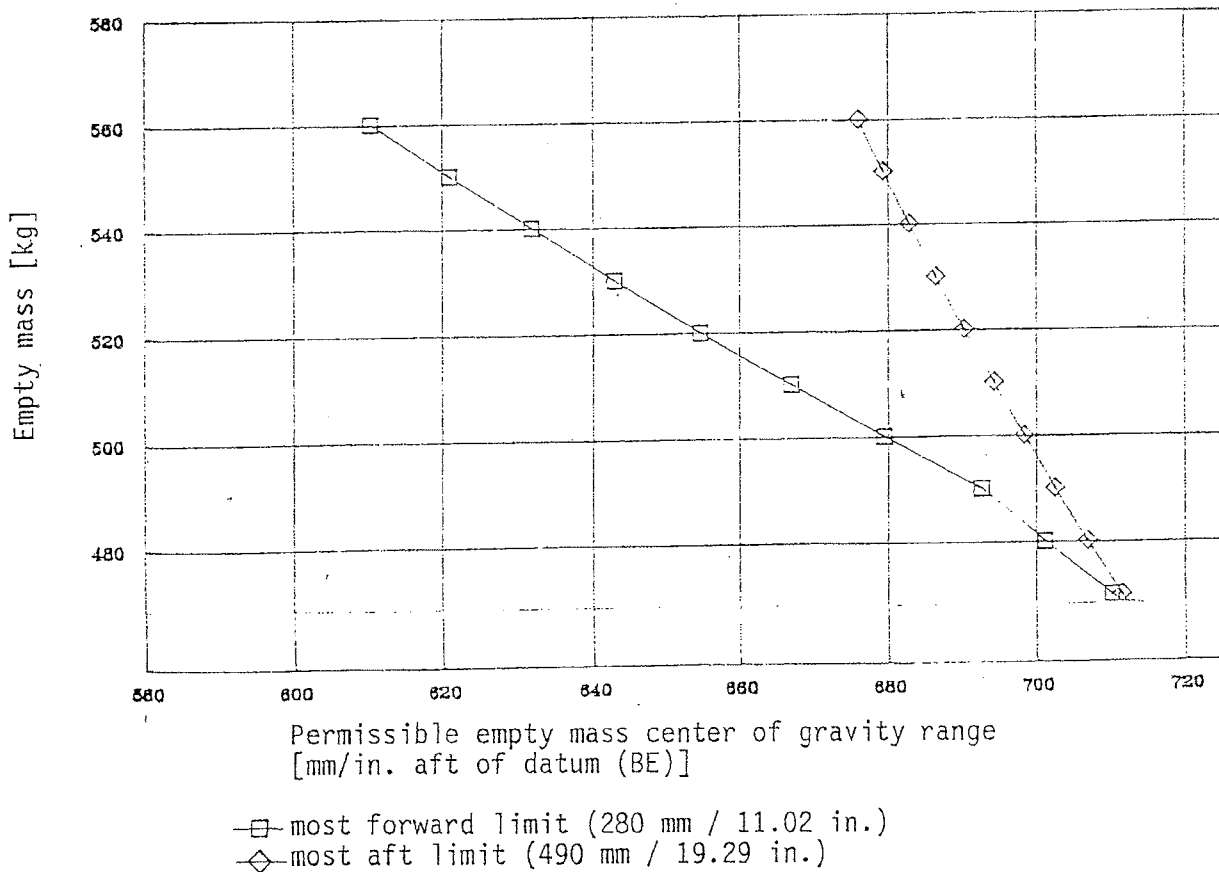
A list of the installed equipment can be obtained from the latest valid inspection report.

Empty mass, empty mass c.g. and payload must be attested under Section 6.2 Page 6.4 of the Pilot's Operating Handbook by an authorized inspector (similar to the German Prüfer für Luftfahrtgerät Klasse 3).

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Empty mass acc. to equipment list		Permissible c.g. position aft of datum (BE)			
kg	lbs	most forward		most aft	
		mm	in	mm	in
470	1036	710	27.95	711	27.99
480	1058	701	27.59	707	27.83
490	1080	693	27.28	702	27.63
500	1102	679	26.73	698	27.48
510	1124	667	26.25	694	27.32
520	1146	655	25.78	690	27.16
530	1168	643	25.31	686	27.00
540	1190	632	24.88	683	26.88
550	1212	621	24.44	679	26.73
560	1234	610	24.01	676	26.61
570	1256	600	23.62	673	26.49



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### 7.6 Flying Mass and Flying Mass Center of Gravity Position

The maximum permissible flying mass is 710 kg (1565 lbs).

The permissible flying mass center of gravity positions are within the range of:

280 - 490 mm (11.02 - 19.29 in) aft of datum plane.  
This corresponds to:  
22.5 - 42.7 % of the mean aerodynamic wing chord.

### 7.7 Mass of Non-Lifting Parts

Maximum mass of all non-lifting parts 535 kg (1179 lbs)

The mass of the non-lifting parts is the total of:

- fuselage and stabilizers
- equipment in the fuselage according to equipment list
- pilots and parachutes
- baggage
- additional equipment, not mandatory for flight and which has not been subject to weighing.

### 7.8 Moment Arms

Pilot:	1132 mm (44.57 in) forward of datum for the front seat
Copilot:	35 mm (1.38 in) aft of datum for the rear seat
Baggage:	630 mm (24.80 in) aft of datum (mean moment arm)
Pilot's trim weights:	1543 mm (60.75 in) forward of datum with 1 trim weight 1560 mm (61.42 in) forward of datum with 2 trim weights
Fixed nose ballast:	2350 mm (92.52 in) forward of datum
Fixed tail ballast:	4900 mm (192.91 in) aft of datum
Fuselage tank:	829 mm (32.64 in) aft of datum
Wing tank:	295 mm (11.61 in) aft of datum (as standard only for variable pitch propeller)

Moment variation for powerplant retraction - extension

- 13895 kgmm (1206.1 in.lb.) for fixed pitch propeller
- 19856 kgmm (1723.5 in.lb.) for variable pitch propeller

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### 7.9 Payload

The payload is affected and limited by various factors:

- Mass of non-lifting parts  
The maximum mass of the non-lifting parts (535 kg/1179 lbs) minus fuselage mass, mass of the horizontal stabilizer and the mass of the minimum equipment according to the Pilot's Operating Handbook Section 2.12 gives the payload value.
- Max. take-off mass  
The maximum take-off mass of the motorglider (710 kg/1565 lbs) minus the empty mass gives a second payload value.

The lower payload value is the decisive value.

The payload comprises:

- pilots and parachutes
- baggage
- additional equipment
- fuel

#### Payload in the Pilots' Seats

Provided the max. mass of the non-lifting parts or the max. take-off mass are not the limiting factors, then the max. payload per seat is 110 kg (243 lbs).

The min. payload in the front seat is 70 kg (154 lbs).  
A weight of less than this must be compensated by trim weights.

#### Payload in the Baggage Compartment

Provided the total payload is not exceeded, then the max. payload in the baggage compartment is 10 kg/22 lbs.

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8. List of Available Equipment

8.1 Safety Harnesses

4-point safety belts in accordance with the following list are required:

Lap Belt (Attachment points on the LH and RH side of the fuselage shell next to the seats)

Type	Manufacturer	Technical Data Sheet No.
FAG-7D/0	Autoflug	40.070/30
Bagu 5202	Gadringer	40.070/32

Shoulder Harness (Attached to the crosstubes located behind each seat)

Type	Manufacturer	Technical Data Sheet No.
FAG-7H/0	Autoflug	40.071/21
Schugu 2700	Gadringer	40.071/05

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8.2 Instruments and Equipment

Parts of the minimum equipment (see POH, Sec. 2.12) or of the additional equipment must be taken from the lists below:

- Minimum Equipment

Pitot Static Airspeed Indicator

Type	Art. No.	Manufacturer	Technical Data Sheet No.
6 FMS 4	6421	Winter	10.210/15
6 FMS 4	6423*	Winter	10.210/15
7 FMS 4	7421	Winter	10.210/19
7 FMS 4	7423*	Winter	10.210/19

\* only for foreign registered motorgliders and airspeed indication in kts

Altimeter

Type	Art. No.	Manufacturer	Technical Data Sheet No.
4 FGH 10	411	Winter	10.220/46
4 FGH 10	433**	Winter	10.220/46
4 FGH 20	422	Winter	10.220/47
5934 M-1	**	United Instruments Inc.	TSO C10b

\*\* only for foreign registered motorgliders and altitude indication in ft

Encoding Altimeter (without indication)

Type	Art. No.	Manufacturer	Technical Data Sheet No.
A - 30	A - 30	ACK Technologies (USA)	10.221/4

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Magnetic Compass

Type	Manufacturer	FAA No.
C 2300	Airpath	ACE-FSD 042

Engine Monitoring Instrument

Type	Manufacturer	Technical Data Sheet No.
TAZ-G103-A	ILEC	
TAZ-G103-AS	ILEC	

- Additional Equipment

Engine Monitoring Instrument

Type	Manufacturer	Technical Data Sheet No.
TAZ-G103-B	ILEC	
TAZ-G103-BS	ILEC	

VHF Transceiver

Type	Manufacturer	Technical Data Sheet No.
AR 3201	Becker	10.911/76
FSG 40-System	W. Dittel	10.911/45
FSG 50	W. Dittel	10.911/71
FSG 60 M	W. Dittel	10.911/72
FSG 70-System	W. Dittel	10.911/81
ATR 720 A	Avionik Dittel (Austria)	10.911/74
ATR 720 B	Avionik Dittel (Austria)	10.911/80

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Vertical Speed Indicator

Type	Art. No.	Manufacturer	Technical Data Sheet No.
5 StVL	5361	Winter	10.230/11
5 StVLM	5561	Winter	10.230/12
5 StV	5231	Winter	10.230/13
5 StV	5251	Winter	10.230/13
5 StV	5253	Winter	10.230/13
5 StV	5261	Winter	10.230/13
5 StV	5281	Winter	10.230/13
5 StV	5291	Winter	10.230/13
5 StVM	5451	Winter	10.230/14
5 StVM	5453	Winter	10.230/14

Turn and Slip Indicator

Type	Art. No.	Manufacturer	Technical Data Sheet No.
WZ 402/ WZ 404		AOA Apparatebau Gauting	10.241/8
WZ-405 IFR 51	51-12-1	AOA Apparatebau Gauting Instruments & Flight Research	10.241/3 TSO C3b

Oxygen System

Type	Manufacturer	Technical Data Sheet No.
Automatic Breathing System HLa	Drägerwerk	40.110/1
Respirator CM 71	Drägerwerk	40.110/13
OXYPORT	Drägerwerk	40.110/18

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### Emergency Locator Transmitter

Type	Manufacturer	Technical Data Sheet No.
EB-2B(CD) Eagle	Mar.Tech.Div.(USA)	10.915/2
Pointer 3000 AP/AF	Pointer	10.915/6*
JE 2 **	Jolliet Electronique	-----

\* different from the Technical Data Sheet, this ELT was certified with a rubber coated helical antenna (Dittel, Part No. 340.0/00)

\*\* only for French registered motorgliders

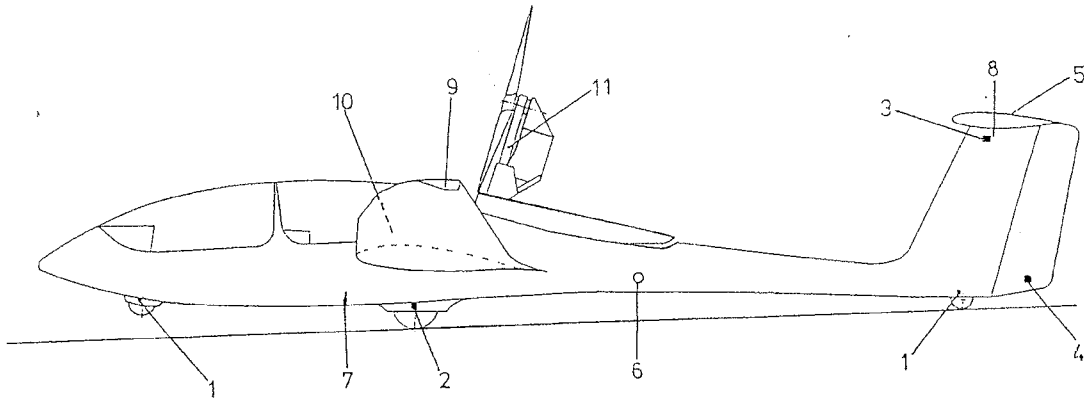
### Hints for Equipment Installation

For information on approved items other than the above listed units please contact the aviation authorities.




(The installation of oxygen systems is also subject to approval and detailed inspection).

9. Placards and Markings

9.1 External Placards and Markings




- |   |  |                               |
|---|--|-------------------------------|
| 1 | Tire Pressure<br>36 PSI 2.5 bar                                      | Nose and tail wheel (RH side) |
| 2 | Tire Pressure<br>36-39.8 PSI 2.5-2.8 bar                             | Main wheel fairing (RH side)  |
| 3 | Align horiz. stab. to arrows<br>Secure with wing-nut<br>Cover closed | Vertical fin (LH side)        |
| 4 | Don't lift<br>here   | Rudder LH and RH side         |
| 5 | Don't push<br>here   | Elevator LH and RH side       |

- 6  Pressure port on LH and RH side of fuselage behind engine compartment
- 7  Arrow to locate winch launching hook (LH and RH side)
- 8  Mark for checking correct rigging of the horizontal stabilizer (total of 4 marks, 2 each on vertical and horizontal stabilizer)
- 9 

33 Liter (8.7 U.S. gal.) (7.3 Imp. gal.) Super fuel unleaded (min. 96 ROZ) 2-Tact-Oil Castrol TTS Mixture ratio 1:50
--

 Fuselage tank
- 10 

47 Liter (12.3 U.S. gal.) (10.3 Imp. gal.) Super fuel unleaded (min. 96 ROZ) 2-Tact-Oil Castrol TTS Mixture ratio 1:50
--

 Wing tank  
(as standard only for variable pitch propeller)
- 11  Engine support LH side

9.2 Internal Placards and Markings

1

Maximum flying weight	710 kg	(1566 lbs)		
Maximum airspeeds:		km/h	kts	mph
in calm air:	V <sub>NE</sub>	248	134	154
in rough air:	V <sub>RA</sub>	175	94	109
Manoeuvring speed:	V <sub>A</sub>	175	94	109
Aerotow:	V <sub>T</sub>	140	76	87
Winch/Automobile tow:	V <sub>W</sub>	140	76	87
Powerplant operation max.:	V <sub>POmax</sub>	110	59	68
Powerplant operation min.:	V <sub>POmin</sub>	90	49	56

RH side wall of front and rear cockpit

2

Towing cable weak link	
aero-, winch- and automobile tow	850 daN 1874 lbs
Tire pressure	
main wheel:	36-39.8 PSI 2.5 - 2.8 bar
nose and tail wheel:	36 PSI 2.5 bar

RH side wall of front cockpit

3

Payload (Pilot and Parachute)	
Minimum load in front cockpit	70 kg 154 lbs
(Less load must be compensated with trim weights)	
Maximum load in front cockpit	110 kg 242 lbs
( The maximum weight must not be exceeded )	

RH side wall of front and rear cockpit

4

- Canopy Jettison and Emergency Exit**
- Retract engine, if possible
  - Pull red-white handle on canopy frame LH fully back
  - Lift canopy
  - Pull red handle on cockpit wall RH fully back
  - Push canopy up
  - Release safety harnesses
  - Stand up, jump out left or right side depending on the glider attitude
  - If possible, dive under wing
  - When using a manual parachute, grip release and pull firmly to full extent after 1 - 3 seconds

Front and rear canopy frame RH side near handle for emergency exit

5

- Check before take-off**
- Wings and horizontal stabilizer connections secured ?
  - Parachute secured ?
  - Straps tight and locked ?
  - Pedals adjusted and locked ?
  - Air brakes locked ?
  - Control system checked ?
  - Trim correctly set ?
  - Radio on and correct frequency ?
  - Altimeter set ?
  - Canopy locked ?
- Launching :**
- Cable on correct hook ?
  - Beware: Crosswind! Cable break!
- Self launching :**
- Fuel quantity checked ?
  - Magneto check; Magneto "Both" ?
  - Ground run up ?
  - Propeller in "Start" position ? (only for variable pitch propeller)

LH side wall of front and rear cockpit

6

Max. baggage: 10 kg (22 lbs)

RH side wall

7

Aerobatic manoeuvres  
are not allowed

Front instrument panel

8

Trim Weights				
Pilots weight including parachute	kg lbs	55 - 62.4 121 - 137	62.5 - 69.9 138 - 153	70 - 110 154 - 242
Number		2	1	0
1 Trim weight 5,6 kg (12.3 lbs)				

LH side wall of front cockpit

9

CHARGING CONNECTOR

Side wall in RH footwell

10

AUXILIARY BATTERY  
 OFF ON

RH canopy frame

11

**Caution!**  
 The guide plate acts as a stop!  
 Do not enlarge the guides of the guide plate.  
 Remove plate only for servicing!

At the guide plate below the front and rear seat

12

[ ]

Green mark for neutral trim position front and rear

13

ON CHOKE OFF

Choke lever front

14

FUEL COCK  
 OFF ON

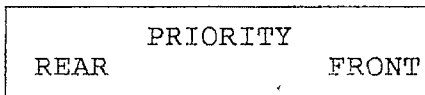
LH side wall of front and rear cockpit

15



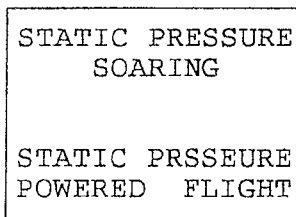
if necessary

16



LH canopy frame

17



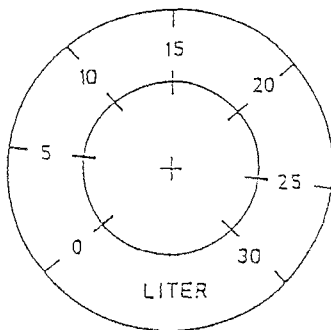
Front instrument panel

18



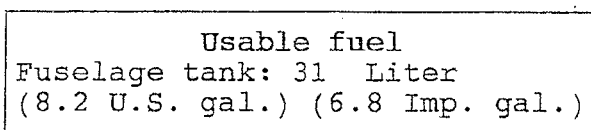
Front and rear instrument panel

19



Front instrument panel  
(only for variable  
pitch propeller)

20



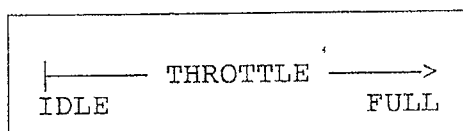
Front instrument panel

21

Altitude		V <sub>NE</sub> (IAS)	
[ m ]	[ft]	[km/h]	[kts]
0 - 2000	0 - 6562	248	134
- 3000	- 9843	237	128
- 5000	-16404	214	116
- 7000	-22966	192	104
- 9000	-29528	171	92

Instrument panel next  
to altimeter

22



Guide plate LH

23

ENGINE BUS CONTROL	AVIONIC BUS CONTROL	COM E-VARIO	ATC	GENERATOR
ENGINE CONTROL	FUEL PUMP*)	POWEPLANT CONTROL	TWO POSITION PROP. MOTOR*)	TWO POSITION PROP.CONTROL*)

RH side wall

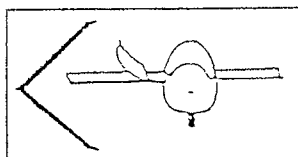
\*) only for variable pitch propeller

24

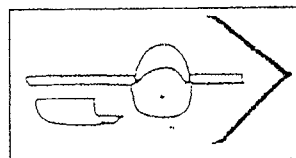
MAIN CIR. BREAKER	BATTERY CHARGING	BATTERY CONTROL	MAIN BUS	AVIONIC BUS	AUXILIARY BATTERY	POWERPLANT OPERATION	MOTOR BUS
-------------------	------------------	-----------------	----------	-------------	-------------------	----------------------	-----------

RH side wall in footwell

25

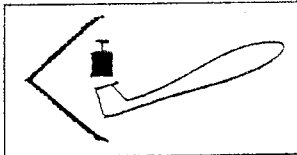


26



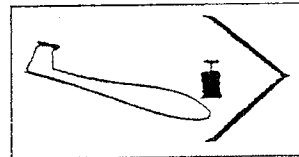
Front and rear canopy release

27

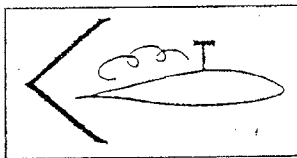


On the trim lever guide plate in the front and rear cockpit

28

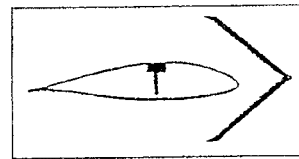


29

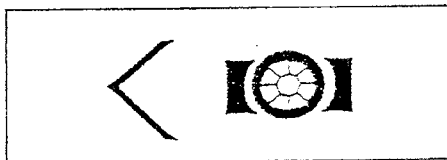


On the front and rear canopy frame above the airbrake lever in the front and rear cockpit

30

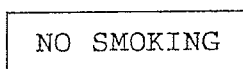


31



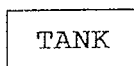
On canopy frame above  
wheel brake lever

32



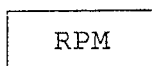
LH side wall front and rear

33



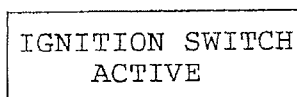
Front instrument panel

34



Front instrument panel

35



Front and rear instrument panel

G 103 C TWIN III SL

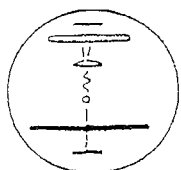
MAINTENANCE MANUAL

36

MASTER SWITCH	ENGINE ELECTRICS	AVIONIC SWITCH	INTER COM	POWERPLANT EXTENDED	PROP. *) TAKE OFF	PROP. *) CRUISING
---------------	------------------	----------------	-----------	---------------------	-------------------	-------------------

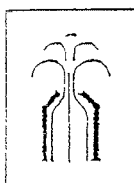
Front and rear instrument panel      \*) only for variable pitch prop.

37



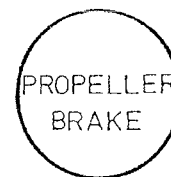
Hook release front and rear

38



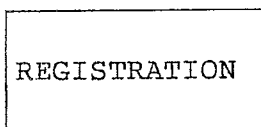
Next to ventilation knob

39



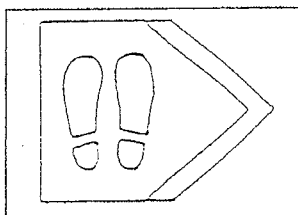
Propeller brake

40



Front instrument panel

41



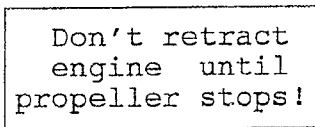
Pedal adjustment

42

TO FLY	N	30	60	E	120	150
STEER						
TO FLY	S	210	240	W	300	330
STEER						
DATE	GROB					

Front and rear instrument panel

43



Front and rear instrument panel

44

Engine RPM	
3500 to 4800	- ---(green)
5800 to 6700	
4900 to 5700	- ---(yellow)
above 6800 RPM	- ---(red)

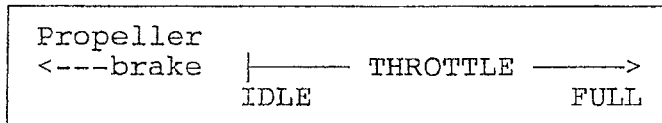
Front and rear instrument panel  
(only for fixed pitch propeller)

45 Only if SB 869-14 has been performed

When manual control for rudder is installed:  
- Pedals in the most forward position?  
- Check of airbrake gate-stop device!  
- Free movement of control and connections secured?

front  
cockpit

46 Only if SB 869-14 has been performed  
(replaces placards no. 22 and 39)



Guide plate LH

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G 103 C TWIN III SL

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MAINTENANCE MANUAL

10. Maintenance Documentation References

- Powerplant

- Manual for ROTAX-engine type 505 A, Issue 2, January 1992
- Repair Manual for ROTAX-engine type 501 and 505, latest issue
- Spare Parts List for ROTAX Engine Type 505<sup>+</sup> - 505A, No. 744, latest issue

- Propeller

Variable pitch propeller MTV-24-M/158-16:

- Operation- and Installation Manual No. E-309, Mechanical Variable Pitch Propeller MTV-24-(), Issue 2, March 1992
- Overhaul Manual and Parts List No. E-310 for the Mechanical Variable Pitch Propeller, latest issue

Fixed pitch propeller KS-1C-158-R-108:

- Operation and Installation Manual No. P3 for the Two Blade Composite Propellers with the Fixed Pitch KS 1 G () () () and KS 1 C () () (), Issue 12.10.1992

- Tow Hooks

- Operating Manual for Tow Releases Series E 85 Nose Tow Release Issue March 1989, LBA approved
- Operating Manual for Safety Tow Releases Series Europa G 88 Safety Tow Release, Issue February 1989, LBA approved

- Oxygen System

Maintenance instructions of the associated manufacturer  
Refer also to the associated Technical Data Sheets

- VHF Transceiver

Maintenance instructions of the associated manufacturer  
Refer also to the associated Technical Data Sheets

- Miscellaneous

For further operating and maintenance instructions refer to the equipment manufacturer's documentation.

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MAINTENANCE MANUAL

11. Airworthiness Limitations

11.1 Recording of Operating Hours

All operating hours must be recorded in the flight log.

11.2 Inspection Procedure for Extension of Service Life

The operating hours are initially limited to 3000 flying hours. During this period specified scheduled servicing must be performed to ensure airworthiness. By performing special inspections, the operating hours can be increased in stages to 12000 flying hours:

1. General

Fatigue tests with wing spars demonstrated that the service life of composite sailplanes and powered sailplanes can be increased to 12000 flying hours if the airworthiness of each aircraft can be demonstrated again by means of a special multi-stage service life test program (in addition to the mandatory annual inspections).

2. Time Limits

When the motorglider has reached a service life of 3000 flying hours a detailed inspection must be conducted according to the program described under Item 3. If the inspection results are positive or after the determined defects have been duly repaired, the service life of the motorglider is increased by 3000 hours i.e. to a total of 6000 flying hours (1st stage).

The above mentioned inspection program must be repeated at 6000 flying hours. If the results are positive or after the determined defects have been duly repaired, the service life is increased to 7000 flying hours (2nd stage).

When the motorglider has reached a service life of 7000 flying hours, conduct the specified inspection program again. If the results are also positive or after the determined defects have been duly repaired, the service life is increased to 8000 operating hours (3rd stage).

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MAINTENANCE MANUAL

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The gradual extension of service life will be performed in steps of 1000 flying hours up to a maximum (for the time being) of 12000 flying hours (4th - 7th stage).

In addition, inspections on the wing connecting bolts and the spar stub bolts are to be performed at 9500, 10500 and 11500 flying hours (see Sec. 4.3).

3. All operators must request the latest issue of the inspection program from the manufacturer. This will include experience gained from the latest inspection results.
4. Inspections may only be conducted by the manufacturer or an authorized repair shop.
5. The inspection results must be recorded on an inspection report. Comments on all procedures must be included. If the inspections are conducted in an authorized repair shop a copy of the inspection report must be forwarded to the manufacturer for information and evaluation.
6. The annual inspection according to § 27 (1) German LuftGerPO is not affected by this regulation.

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G 103 C TWIN III SL

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MAINTENANCE MANUAL

11.3 Life Limit Items

For the following parts a time between overhaul (TBO) has been established:

- Powerplant up to S/N 3.339.897      300 hours
- Powerplant as of S/N 3.339.898      300 hours or 6 years
  
- Magnetos (ignition boxes)          300 hours
  
- Variable Pitch Propeller            400 hours or 60 months
- (see Service Bulletin MT-Propeller No. 1N)
  
- Fixed pitch Propeller                300 hours
- (see Service Bulletin Technoflug Leichtflugzeugbau GmbH No. P1)

- Tow Hooks

The TOST tow hooks (installed as standard equipment) are limited to 48 months of operation (calculated from the date of installation in the aircraft) or a maximum of 2000 launches whichever comes first. The hooks must then be inspected.

- Oxygen System

The TBO of installed oxygen systems can be seen from the corresponding acceptance report.

In addition, national regulations for inspections of the oxygen bottles must be observed, if applicable.

The following parts are subject to life limits:

- Fuel hoses
- all types                            5 years
  
- Fuel filter with polyamid strainer
- Fa. Künzer Part No. RT3...          25 hours
  
- Air filter                            50 hours
  
- Toothed belt                         300 hours or 6 years
  
- Safety Harnesses
- AUTOFLUG                            10 years
- GADRINGER                           12 years
  
- Plate with limit switches 4VE      300 hours

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MAINTENANCE MANUAL

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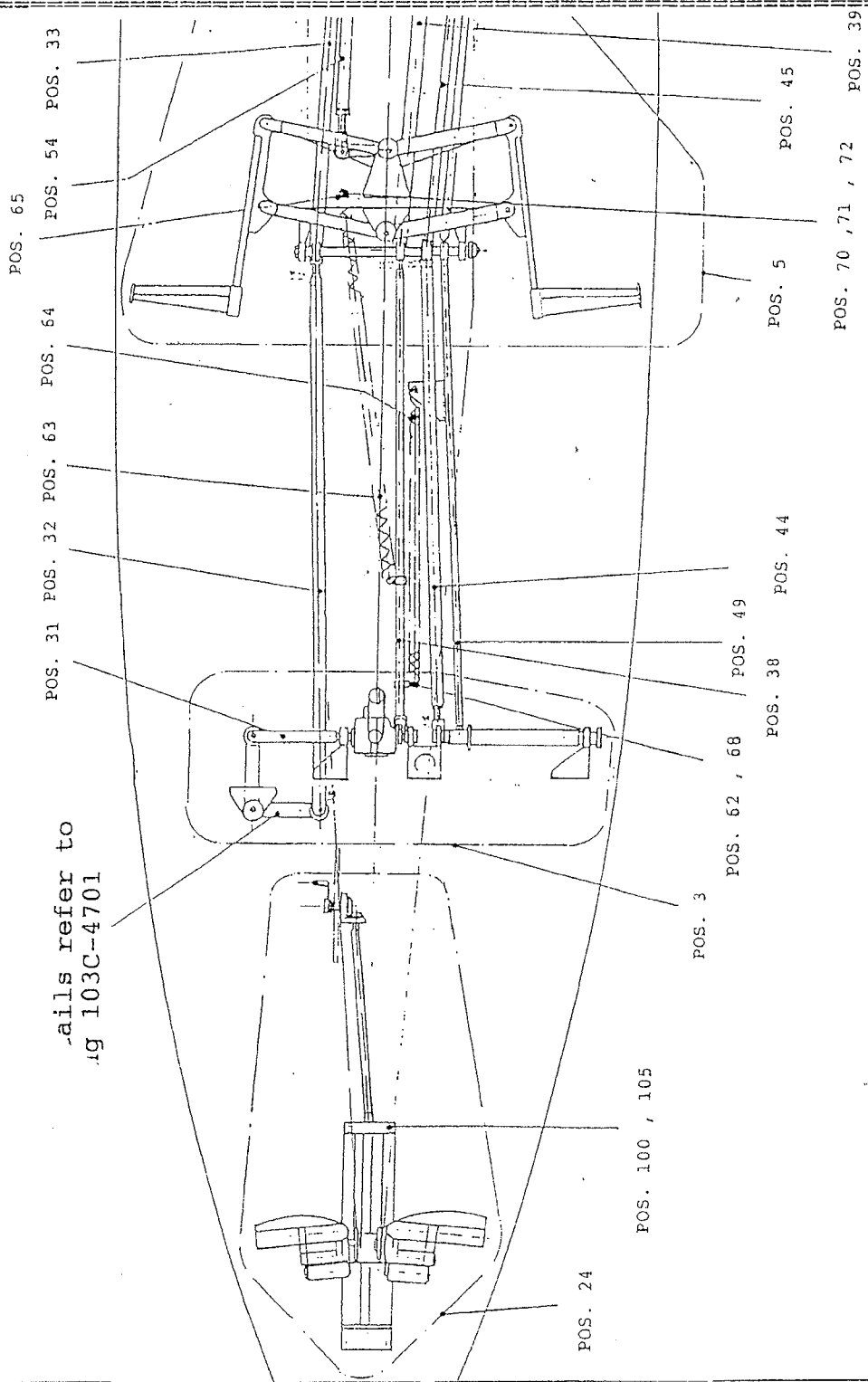
12. List of Special Tools

<u>Tool</u>	<u>Application</u>
Nicopress pliers and reference gauge	Control cable connections
Socket for grooved nut (103SL-W-6400) Puller M 36 x 1.5	Toothed belt pulley wheels
Adjustment plate, upper (103SL-W6-6400.01)	Parallelism of axis
Adjustment plate, lower (103SL-W6-6400.02)	Parallelism of axis

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MAINTENANCE MANUAL

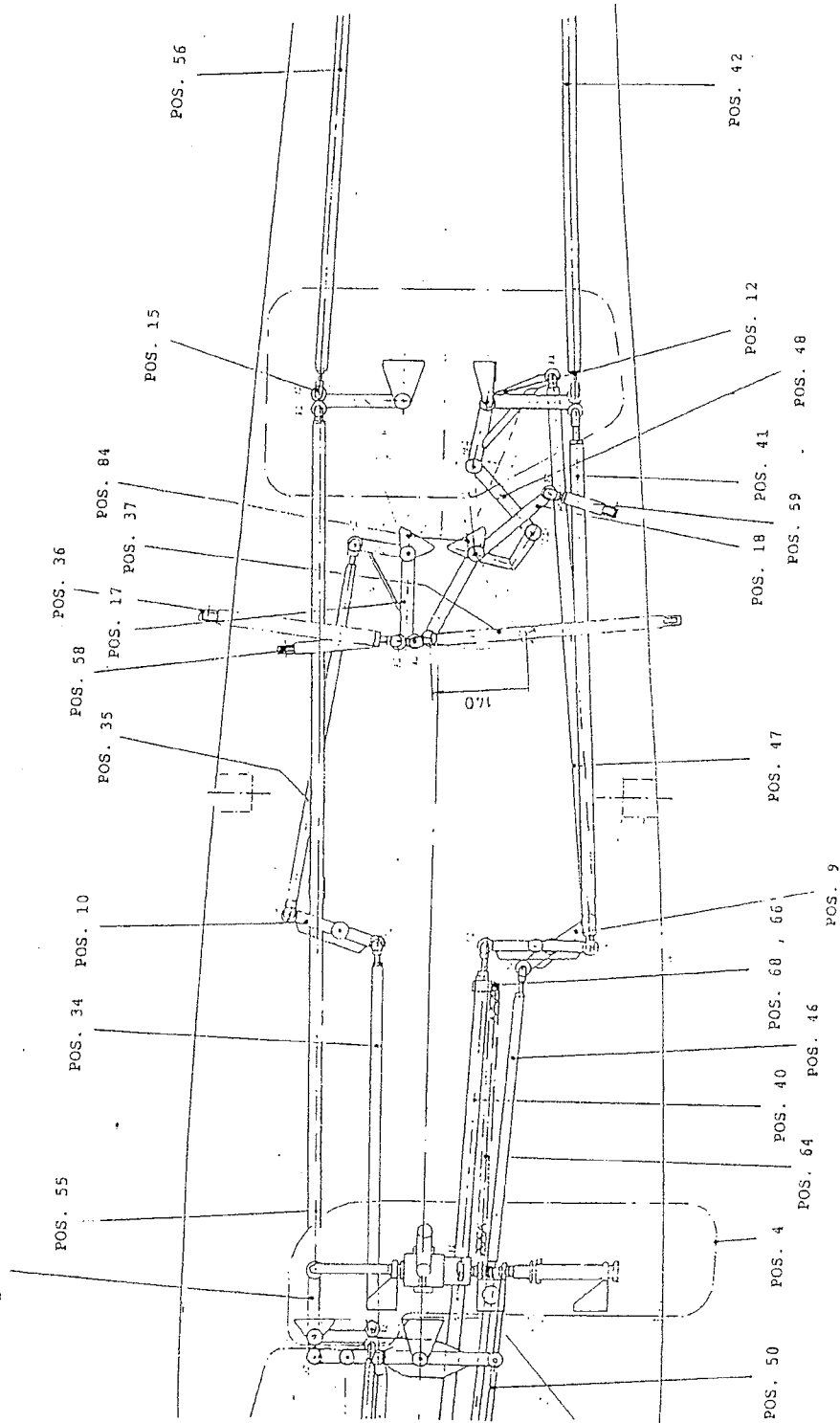
A1 Fuselage  
Controls



ails refer to  
fig 103C-4701

A1 Fuselage  
Controls

For details refer to  
drawing 103SL-4710



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MAINTENANCE MANUAL

Parts List: Fuselage Controls

Item	Designation	Part No.
3	Stick assembly front	103 C - 4701
4	Stick assembly rear	103 SL- 4710
5	Pedal assembly rear	103 SL- 4420
9	Reversing left	103 B - 4431/1
10	Reversing right	103 B - 4434/1
12	Airbrake reversing	103 B - 4437
15	Rudder swivel	103 B - 4441
17	Aileron lever	103 B - 4454/1
18	Airbrake lever	103 C - 4451
19	Elevator connector right	103 B - 4768
20	Elevator connector left	103 B - 4767
21	Lever	103 B - 4765
22	Lever	103 C - 4763
23	Lever	103 B - 4761
24	Pedal assembly front	103 SL- 4800
31	Aileron rod 1	102 C3- 4351/1
32	Aileron rod 2	103 C - 4552
33	Aileron rod 3	103 B - 4553/1
34	Aileron rod 4	103 B - 4554
35	Aileron rod 5	103 B - 4555
36	Aileron connector right	103 B - 4556
37	Aileron connector left	103 B - 4557
38	Elevator rod 1	103 B - 4560
39	Elevator rod 2	103 B - 4561
40	Elevator rod 3	103 C - 4562
41	Elevator rod 4	103 B - 4563
42	Elevator rod 5	103 A - 4790
43	Elevator rod 6	103 C - 4794

Parts List: Fuselage Controls (continued)

Item	Designation	Part No.
44	Airbrake rod 1	103 C - 4570
45	Airbrake rod 2	103 B - 4571
46	Airbrake rod 3	103 C - 4572
47	Airbrake rod 4	103 B - 4573
48	Airbrake rod 5	103 B - 4574
49	Trim rod 1	103 C - 4785
50	Trim rod 2	103 C - 4786
54	Rudder rod 1	103 B - 4586/1
55	Rudder rod 2	103 B - 4587
56	Rudder rod 3	103 A - 4692
58	Airbrake connector right	103 B - 4558
59	Airbrake connector left	103 B - 4591
62	Sheet	103 C - 4760.01
63	Spring	103 C - 4760.02
64	Spring	103 C - 4760.03
65	Angle fitting	103 C - 4760.04
66	Sheet	103 C - 4760.05
68	Clamp	S 16/12 ZY W1
70	Screw	LN 9037 M5x28
71	Washer	DIN 9021-5.3
72	Nut	LN 9348 M5
83	Bracket	109 - 2053
84	Bracket	102C3 - 2054
89	Screw	LN 9037 M6x28
90	Screw	LN 9037 M6x32
94	Screw	LN 9037 M6x60
100	Nut	LN 9348 M6
105	Washer	LN 9025-6.4

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G 103 C TWIN III SL

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MAINTENANCE MANUAL

Parts List: Fuselage Controls (continued)

If SB 869-14 is included

replace

Item	Designation	Part No.
3	Stick assembly front	103 C - 4701
	Airbrake trim unit front	103 C - 4405
	Airbrake trim unit rear	103 SL- 4412
44	Airbrake rod 1	103 C - 4570

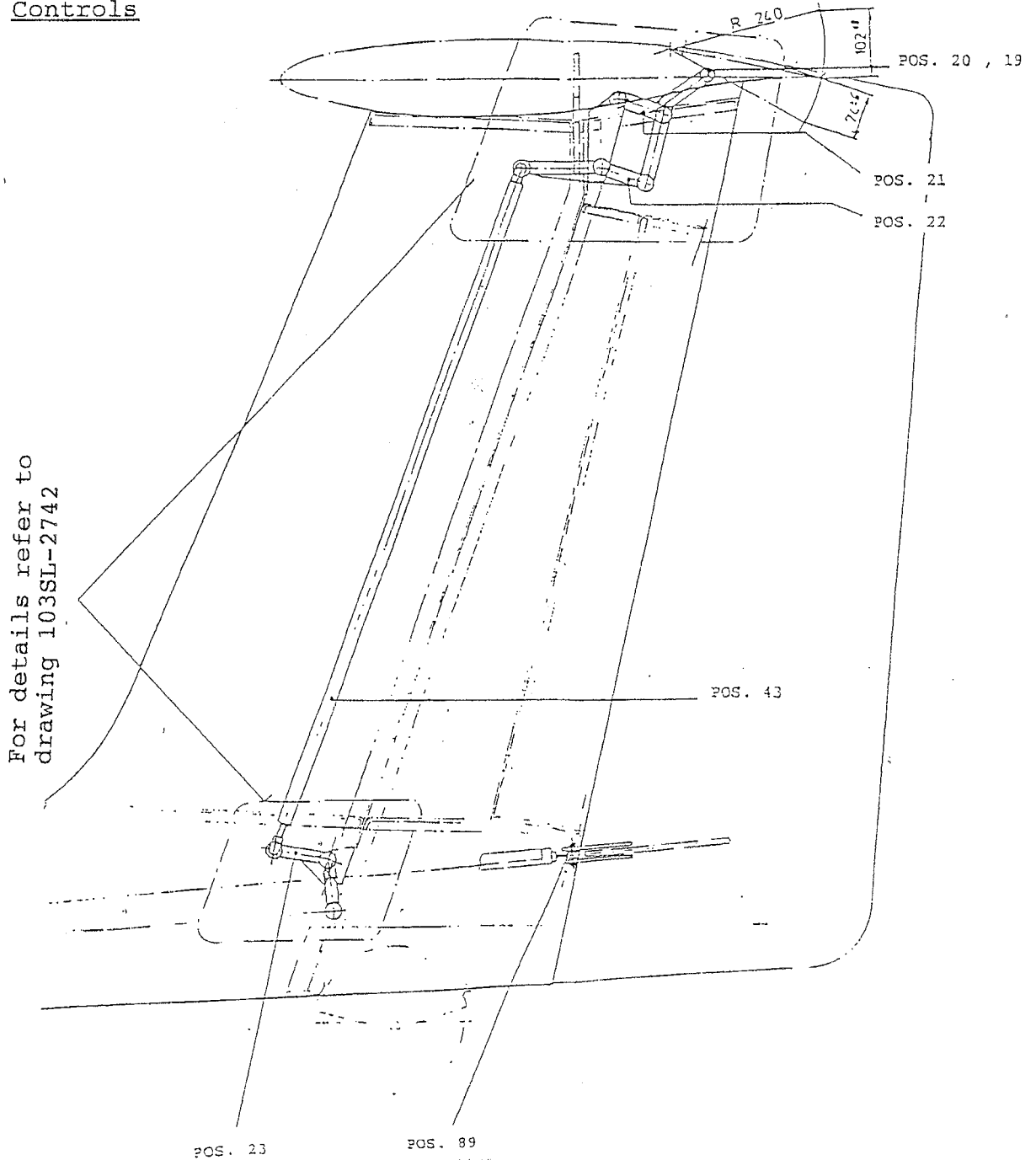
by

Item	Designation	Part No.
	Stick assembly front	103 C - 4905
	Airbrake trim unit front	103 C - 4910
	Airbrake trim unit rear	103 C - 4915
	Airbrake rod	103 C - 4920

Additional parts

Item	Designation	Part No.
	Rudder hand lever	103 C - 4930
	Rod	103 C - 4950
	Connection	103 C - 4935

A1 Fuselage  
Controls





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G 103 C TWIN III SL

MAINTENANCE MANUAL  
=====

Parts List: Wing Controls

Aileron Controls

Item	Designation	Part No.
1	Connection lever left	103 B - 4735
	Connection lever right	103 B - 4736
3	Differential lever left	103 SL- 4737
	Differential lever right	103 SL- 4738
5	Aileron lever	115 - 4254
6	Aileron rod 6	103 C - 4113
7	Aileron rod 7	103 C - 4114
8	Aileron rod 8	103 C - 4115
9	Yoke	102 - 4249
10	Bracket	109 - 2053
11	Bracket	102C3 - 2054

Air Brake Controls:

Item	Designation	Part No.
1	Swivel left	103 C - 4721
	Swivel right	103 C - 4722
3	Locking lever left	103 C - 4723
	Locking lever right	103 C - 4724
5	Airbrake rod 6 left	103 C - 4117
6	Airbrake rod 6 right	103 C - 4118
7	Airbrake rod 7	103 C - 4119
8	Airbrake rod 8	103 C - 4120
9	Bracket left	103 C - 4105
	Bracket right	103 C - 4106

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MAINTENANCE MANUAL

Marking of Rods in Fuselage and Wing

QR1 102C3-4351/1	QR8 103C-4115	BKVre.103B-4558
QR1 102C3-4351/1	HR1 103B-4560	BK6li 103C-4117
QR2 103C-4552	HR2 103B-4561	BK6re 103C-4118
QR3 103B-4553/1	HR3 103C-4562	BK7 103C-4119
QR4 103B-4554	HR4 103B-4563	BK7 103C-4119
QR5 103B-4555	HR5 103A-4790	BK8 103C-4120
QRVli 103B-4557	HR6 103A-4794	BK8 103C-4120
QRVre 103B-4556	BK1 103C-4570	TR1 103C-4785
QR6 103C-4113	BK2 103B-4571	TR2 103C-4786
QR6 103C-4113	BK3 103C-4572	SR1 103B-4586/1
QR7 103C-4114	BK4 103B-4573	SR2 103B-4587
QR7 103C-4114	BK5 103B-4574	SR3 103A-4692
QR8 103C-4115	BKVli 103B-4591	

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G 103 C TWIN III SL

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MAINTENANCE MANUAL

A3 Inspection Panels

The control elements in the rear fuselage are accessed through two plexiglass inspection panels on the left side of the fuselage. The bottom inspection panel is at the lower part of the vertical stabilizer and, when the rudder is removed, provides access to the bottom elevator bellcrank. The top inspection panel provides easy access to the automatic elevator connection. See also Appendix A1.

Access to the wing controls is provided by three plexiglass inspection panels on the lower side of each wing. They are located near the aileron bellcranks and the airbrake locking lever. See also Appendix A2.

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G 103 C TWIN III SL

MAINTENANCE MANUAL

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A4 Color Markings

The color markings on the fuselage consist of decorative stripes leading from the nose tow hook to the canopy cut-out and from the nose tow hook to the wing roots below the canopies. A further stripe is located on the left and right side of the rudder.

The color of the decorative stripes is RAL 5017.

Burkhart Grob Luft- und Raumfahrt  
GmbH & Co. KG, D-8939 Mattsies

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G 103 C TWIN III SL

REPAIR INSTRUCTIONS

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## BURKHART GROB

LUFT- UND RAUMFAHRT GmbH & Co. KG  
8939 Mattsies

# REPAIR INSTRUCTIONS

Model : G 103 C TWIN III SL

Serial No. : .....

Registration No.: .....

Date of Issue : December 1991

Owner : .....

.....

.....

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G 103 C TWIN III SL

REPAIR INSTRUCTIONS

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Table of Contents	Page
1. General	A 5.2
2. Material and Suppliers	A 5.2
3. Simplified Lamination Lay-Up Plan	A 5.5
4. Repair of Fiber Composite Components	A 5.8
5. Damage to Fiber Composite/Foam Sandwich Components	A 5.9
6. Damage to Fiber Composite Components with Tridimensional Fabric Sandwich	A 5.10
7. Damage to Pure Fiber Composite Components	A 5.11
8. Damage to Spar Cap	A 5.11
9. Paintwork	A 5.11
10. Repair of Fittings	A 5.13
11. Replacement of Control Cables	A 5.14
12. Major Repairs	A 5.14

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G 103 C TWIN III SL

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REPAIR INSTRUCTIONS

1. General

The G 103C TWIN III SL is made of fiber composite material. Compared to the G 103 C TWIN III ACRO, the fuselage has been considerably improved in several areas. For example the fuselage tube as of the main landing gear, i.e. the entire rear fuselage, is made from carbon fiber. The vertical stabilizer is also made from carbon fiber. The rudder is made from ARP. The two-part wing consists of CRP-/ARP-sandwich shells with spar caps made from carbon fiber rovings and the spar web made of GRP foam sandwich. The ailerons are made of CRP/ARP, the horizontal stabilizer and the elevator are made of carbon fiber.

2. Material and Suppliers

Resin:

L 285 100 GWT Scheufler Co.
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Hardener:

285/286/287 38-40 GWT Scheufler Co.
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GWT = parts by weight (mixture ratio)

Supplier: Martin G. Scheufler  
Kunstharzprodukte GmbH  
Postfach 610238  
Am Ostkai 21/22  
D-7000 Stuttgart 61

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Supplier:

Fabric (Glass/Carbon/Aramide Fiber):

Interglas Textil GmbH  
Söflinger Str. 246  
D-7900 Ulm

C. Cramer  
Weberei Heek-Nienburg  
GmbH & Co. KG  
Postfach 209  
D-4438 Heek-Nienburg

Glass Roving:

EC 9-756 K 43

Gevetex  
Postfach 12 05  
D-4000 Düsseldorf

Tridimensional Cloth:

13 431

Vorwerk  
Möbelstoffwerke GmbH & Co.  
Postfach 2029  
D-8650 Kulmbach

Carbon Fiber Rovings:

Tenax HTA 12 K

ENKA AG  
Postfach 10 01 49  
D-5600 Wuppertal 1

Carbon UD Tape:

KDU 1009  
KDU 1034

SIGRI GmbH  
Postfach 11 60  
D-8901 Meitingen

Foam Material:

PVC Hard Foam  
Divinycell H 60  
Thickness: 3, 4, 6 and 8 mm

Diab-Barracuda  
Am Bahndamm 20  
D-3000 Hannover 91

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**Filling Material for Resin:**

Microballoons brown

Bäder GmbH & Co. KG  
Lackfabrik  
Postfach 25  
D-7300 Esslingen

Cotton Flocks

Schwarzwälder Textil-Werke  
Postfach 4  
D-7623 Schenkenzell

**Paint:**

UP-Vorgelat T 35  
UP-Hardener SF 2  
Thinner SF

Martin G. Scheufler  
Kunstharzprodukte GmbH  
Postfach 610238  
Am Ostkai 21/22  
D-7000 Stuttgart 61

Antistatic paint  
Aerostatic F

MAP  
ZI - Chemin de la Rijole  
F-09100 Pamiers  
France

Paint for decorative stripes:  
Nitro-Cellulose-Kombilack.  
RAL 5017

Bäder GmbH & Co. KG  
Lackfabrik  
Postfach 25  
D-7300 Esslingen

**Control Cables:**

B 2.4 LN 9374 galvanized C steel wire  
B 3.2 LN 9374 galvanized C steel wire

**Control Cable Connections:**

Thimbles: A 3.5 DIN 6899 hot galvanized  
Clamps: Nicopress NT 28 2 G or NT 28 3 M

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3. Simplified Lamination Lay-Up Plan

The following tables contain only the lamination lay-up plans for the pure shells. Reinforcements in areas subject to special stress and in force pick-up are not listed. For major repairs, request the complete lay-up plan from the manufacturer.

- Fuselage

No. of Layers	WL	INTERGLAS	CC STYLE	Foam Core	Remarks
Cockpit area					
1	8.4548.60	92 110			0°/90°
1	8.4525.60	92 146			0°
3	8.4554.60	92 140			±45°
Fuselage Tube Rear					
1	8.4548.60	92 110			0°/90°
1			CC 756		0°
4	8.3520.80-2	98 141	CC 452		±45°, 0°/90°, ±45°, 0°/90°
Vertical Fin					
1	8.4505.60	90 070			0°/90°
3	8.3520.80-2	98 141	CC 452		±45°, 0°/90°, ±45°

- Rudder

RH/LH Shell

No. of Layers	WL	INTERGLAS	CC STYLE	Foam Core	Remarks
1	5.2231.30	98 608	CC 140		±45°
	5.1360.2			H 60	Divinycell 4 mm
1	5.2230.30	98 605	CC 120		0°/90°

WL = German Data Sheet for an Aviation Material

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- Wing

Upper/Lower Shell

No. of Layers	WL	INTERGLAS	CC STYLE	Foam Core	Remarks
2	5.1360.2		CC 763		+45°, -45°
1	5.2231.30	98 608	CC 140	H 60	Divinycell 8 mm 0°/90°

- Aileron

Upper/Lower Shell

No. of Layers	WL	INTERGLAS	CC STYLE	Foam Core	Remarks
1			CC 495		±45°
1	8.3520.80-2	98 141	CC 452		±45°
	5.1360.2			H 60	Divinycell 4 mm
1	5.2230.30	98 605	CC 120		0°/90°

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- Horizontal Stabilizer

Upper/Lower Shell

No. of Layers	WL	INTERGLAS	CC STYLE	Foam Core	Remarks
1	5.1360.2		CC 495		$\pm 45^\circ$
1	5.2230.30	98 605	CC 120	H 60	Divinycell 6 mm $0^\circ/90^\circ$

- Elevator

Upper/Lower Shell

No. of Layers	WL	INTERGLAS	CC STYLE	Foam Core	Remarks
1	5.1360.2		CC 495		$\pm 45^\circ$
1	5.2230.30	98 605	CC 120	H 60	Divinycell 4 mm $0^\circ/90^\circ$

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REPAIR INSTRUCTIONS

4. Repair of Fiber Composite Components

If the aircraft is damaged, first establish the extent of damage. Very often other structural parts are involved; a fracture sometimes extends invisibly underneath the outer surface.

Carry out repairs with extreme care. The outer skin of fiber composite aircraft is load bearing; a structural failure could lead to a crash.

Keep to the exact resin-hardener mixture ratio ( $\pm 0.5\%$ ) and use a clean mixing pot. The fabric to resin mixture ratio is approximately 50:50 (by weight). To avoid dirt penetration and thus loss of good adhesion, grind the sections to be repaired just before laying up the saturated laminate.

Similar to plywood, the direction of the individual fibers (lengthwise or diagonal) is of great importance to strength. You can see from the simplified lamination lay-up plan approximately how many layers are necessary to restore the structural strength of the damaged section. Always measure the thickness of the destroyed laminate. If you break off a piece from GRP and ignite it, the resin will burn off. The glass fabric will remain, thus allowing you to determine type, number of layers and direction.

Splicing is time consuming. Take the trouble to grind the surface to such an extent that the fabric patches which will be applied do not protrude past the contour. They must not be ground off for aesthetic reasons.

If you want to decrease the hardening time, increase the ambient temperature with a fan heater.

**Attention:** An excessively high temperature will produce large air bubbles in the fabric. Make a foil tent into which the hot air is introduced. This avoids local overheating.

Make sure that the weight of repaired control surfaces does not increase to avoid the danger of flutter (see also Section 3.3).

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REPAIR INSTRUCTIONS

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5. Damage to Fiber Composite/Foam Sandwich Components  
(Fiber Composite/Hard Foam Sandwich)

In some cases only the surface (outer laminate) is damaged. It can also happen that the entire skin (outer and inner laminate and hard foam) is destroyed.

a) Simple Surface Damage (Fig. 1 Page A 5.12)

In the proximity of a crack, the laminate can become detached from the supporting foam. Determine this section by knocking. Remove the detached laminate (use a grinding disk, grinding block or sharp knife). Splice the fabric around the damage using a grinding sheet. The splice length per layer is approximately 20 mm; the laminate thickness to splice length ratio is approximately 1:50.

After splicing, clean the repaired section thoroughly as follows:

- Remove the grinding dust (also from the foam pores!) with compressed air (the compressed air plant must be equipped with an oil and water separator!).
- Clean the splice with carbon tetrachloride or acetone in case it had been contaminated with dirt or grease.

**Warning:** Do not wipe the Gel-Coat into the splice.

Fill the dimples and foam pores with resin and microballoons. Then apply the required laminate in the correct direction.

**Important:** Apply large patches first. Repairs must be free from dirt and grease.

At room temperature the resin will harden in about 8 hours. The repaired section may now be ground, primed and painted.

**Attention:** Grind the edges of the fabric patches only!

b) Damage to the Entire Sandwich (Fig. 2 and 3 Page A 5.12)

If the inner laminate is also destroyed, first remove the outer laminate not adhering to the foam. Now open out the hole until the inner laminate is adhering to the foam. To enable the inner laminate to be repaired, remove sufficient supporting foam to obtain an internal protruding edge of at least 20 mm (laminate thickness to protrusion ratio: approximately 1:50).