0 General

0.1 Manual amendments

No.	Page	Description	Date
0.1	all	Combination of the initial	May 2011
		Maintenance Manuals of the	
		Variants LS1-f and LS1-f(45),	
		new standardized format	
0.2	0.8, 1.1 up to 1.3, 2.1 up to	Miscellaneous changes to the	May 2011
	2.4, 2.6, 3.1 up to 3.7,	contents of the latest	
	4.1 up to 4.17, 5.1, 5.2	amendments of the initial	
	6.1 up to 6.3, 7.1, 7.2	maintenance manuals	
	8.1 up to 8.4, 9.1, 9.2		
	10.1 up to 10.8, 11.1, 11.2,		
	12.1 up to 12.8		
1	0.1, 0.3, 0.4, 2.2 - 2.4, 6.1	TN63-LS: Winglets, increase	May 2017
	-6.5, 12.1	of max. mass of non-lifting	
		parts	

0.2 List of effective pages

0 0.1 May 2011 See manual amendments 0.3 " 0.4 " 0.5 " 0.6 " 0.7 " 0.8 " 1 1.1 May 2011 1.2 " 1 1.2 " 1.2 " 1.2 1.2 1.3 " 1.3		of effect	tive pages						
0.2	Section		issued	replaced					
0.3	0			See manual amendments					
0.4									
0.5 " 0.6 " 0.7 " 0.8 " 1 1.1 May 2011 1.2 " 1.3 " 2 2.1 May 2011 2.2 " May 2017 2.3 " May 2017 2.4 " May 2017 2.5 " 2.6 3 3.1 May 2011 3.2 " 3.3 " 3.4 " 3.5 " 3.6 " 3.7 " 4 4.1 May 2011 4.2 " 4.3 " 4.4 " 4.5 " 4.6 " 4.7 " 4.8 " 4.9 " 4.10 " 4.11 " 4.12 "		0.3	"						
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7.12		4.11	"						
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List of effective pages cont.

Section	page	issued	replaced	replaced	replaced
	4.14	May 2011		1	1
	4.15	"			
	4.16	"			
	4.17	"			
5	5.1	May 2011			
	5.2	"			
6	6.1	May 2011	May 2017		
	6.2	"	May 2017		
	6.3	"	May 2017		
	6.4	"	May 2017		
	6.5	May 2017			
7	7.1	May 2011			
	7.2	"			
8	8.1	May 2011			
	8.2	"			
	8.3	"			
	8.4	"			
9	9.1	May 2011			
	9.2	"			
10	10.1	May 2011			
	10.2	"			
	10.3	"			
	10.4	"			
	10.5	"			
	10.6	"			
	10.7	"			
	10.8	"			
11	11.1	May 2011			
	11.2	"			
12	12.1	May 2011	May 2017		
	12.3	"			
	12.4	"			
	12.5	"			
	12.6	"			
	12.7	"			
	12.8	"			

Weighing Procedure continued

7. Calculate C.G. position

8. Operating limits

Max. TOW: **LS1-f**: 390 kg (860 lbs.) **LS1-f(45)**: 439 kg (968 lbs.)

Max. mass of non lifting parts, **all variants** GNT_{limit}: 230 kg (507 lbs.) Max. cockpit load nominal, **all variants**: 110 kg (243 lbs.)

- 9. Repeat the weight and balance at least every 4 years.
- 10. Execute a new weight and balance whenever the equipment was changed.
- 11. Calculate loading limits according to section 2.2.

2.2 Calculation of loading limits

2.2.1 Minimum cockpit load

The higher values in the Empty mass C.G. table (section 2.3) are for a minimum cockpit load of 60 kg (132 lbs.). In case the empty mass C.G. value determined from the weight and balance is higher than the value from the table the min. cockpit load may be raised according to the following equation (all distances in mm, 25.4mm= 1 in.):

$$KL = \text{empty mass C.G. from weighing} \\ 420 = \text{aft inflight C.G. limit} \\ GL = \text{empty mass from weighing} \\ 1020 \\ 1020 = 420 + 600 \text{ (pilot lever arm)} \\ GP_{\text{min}} = \text{new min. cockpit load}$$

Round up GP_{min} to next plain number in kg or lbs..

For club operation the min. cockpit load should not exceed 60 kg.

The new cockpit load must be entered:

- 1. in the weighing report
- 2. in the cockpit data placard
- 3. in the table in the flight manual section 6.8.4

Calculation of loading limits continued

2.2.2 Maximum cockpit load

The lower values in the Empty mass C.G. table (section 2.3) are for a maximum cockpit load of 110 kg (243 lbs.). In case the empty mass C.G. value determined from the weight and balance is lower than the value from the table permanent ballast must be installed in the tail according to section 7.1.

The maximum cockpit load may be limited by the max. payload without water ballast according to section 2.2.4.

The resulting maximum cockpit load must be entered:

- 1. in the weighing report
- 2. in the cockpit data placard
- 3. in the table in the flight manual section 6.8.4

2.2.3 Max mass without water ballast

oW=without water ballast

 $G_{\text{max oW}} = G_{\text{wings}} + GNT_{\text{max.}}$ but not higher than the max. TOW

 $GNT_{max.} = 230 \text{ kg}$ 507 lbs without Option winglets.

 $GNT_{max.} = 250 \text{ kg}$ 517 lbs with Option winglets.

2.2.4 Max. payload without water ballast

Max. payload without water ballast= $G_{max oW}$ - G_{empty}

2.2.5 Max. payload with water ballast

Max. payload with water ballast= G_{max} - G_{empty}

Note: Enter the locations of all batteries installed during weight and balance in the weighing report and in the equipment list.

2.2.6 Example for calculation of loading limits (LS1-f)

Note: This example is valid for LS1-f without Option winglets.

1 kg=2.2046 lbs., 1 in.= 25.4 mm

- 1) Min. cockpit load
- a) Empty mass 242 kg. empty mass C.G. 648 mm, the empty mass C.G. is in the limits of the table section 2.3. This means, that the min. cockpit load is 60 kg (limit 673 mm > 648 mm).
- b) Empty mass 242 kg. empty mass C.G. 720 mm, the empty mass C.G. is outside the limits of the table section 2.3. This means, that the min. cockpit load must be raised according to the equation in section 2.2.1 to 71.2 kg, rounded up to 72 kg (limit 673 mm < 720 mm).
- 2) Max. mass without water ballast

Wings	115 kg
Max. mass of non-lifting parts	230 kg
Sum= Max. mass without water ballast	345 kg

3) Max. pay load without water ballast

wax. pay road without water buriast	
Max. mass without water ballast	345 kg
Empty mass	242 kg
Difference= Max. pay load	103 kg

4) Entry in flight manual section 6.8.4 (for min. cockpit load example b))

Empty mass	242 kg
Max. cockpit load	103 kg
Max. mass without water ballast	345 kg
Max. pay load with water ballast	148 kg
Max. mass with water ballast	390
kg	

Min. cockpit load 72 kg

Entry in flight manual section 6.8.4 for LS1-d (example)

Empty mass	242 kg		
Empty mass C.G.	720 mm		
Max. pay load without water ballast.	103 kg		
Max. mass without water ballast	345 kg		
Max. pay load with water ballast	148 kg		
Max. mass with water ballast	390 kg		
Min. cockpit load	72 kg		

6 Placards and markings

6.1 Placards and markings LS1-f

Without Option winglets

Type: LS1-f								
Serial No.:	Registrati	on:						
Airspeed limits:			•					
Winch launch and auto tow	130 km/h	81 mph	70 kts.					
Aero tow	170 km/h	106 mph	92 kts.					
Manoeuvring	170 km/h	106 mph	92 kts.					
Rough air	250 km/h	155 mph	135 kts.					
Never exceed	250 km/h	155 mph	135 kts.					
Aerobatic manoeuvres are prof	nibited							
Max. take-off mass	390 kg	860 lbs.						
Pilot weight incl. max:	110 kg	242 lbs.						
Parachute min:	60 kg	132 lbs.						
Lighter pilots must compensate	lack of weig	ght as sugge	ested in					
Flight Manual.								

Clearly visible at right cockpit wall

with Option winglets

Type: LS1-f								
Serial No.:	Regis	tration:						
Airspeed limits:								
Winch launch and auto	130 km/h	81 mph	70 kts.					
tow								
Aero tow	170 km/h	106 mph	92 kts.					
Manoeuvring	170 km/h	106 mph	92 kts.					
Rough air	250 km/h	155 mph	135 kts.					
Never exceed	250 km/h	155 mph	135 kts.					
Aerobatic manoeuvres a	are prohibite	ed.						
If the sailplane will be o	perated with	n winglets th	ne use of					
water ballast is prohibite	ed.							
Max. take-off mass	390 kg	860 lbs.						
Pilot weight incl. max:	110 kg	242 lbs.						
Parachute min:	60 kg	132 lbs.						
With lower pilot weight r	necessary b	allast must	be added.					

Clearly visible at right cockpit wall

Altitude in [m]	0-2000	3000	4000	5000	6000	7000	8000	9000	10000
VNE IAS km/h	250	237	225	214	202	191	180	170	160
Altitude in [ft]	0-6560	9843	13124	16405	19685	22966	26247	29528	32809
VNE IAS kts.	135	128	122	115	109	103	97	92	86

Clearly visible at right cockpit wall

Airspeed indicator markings

green	ar	c		yellov	v arc			red line	
80	-	170	km/h	170	-	250	km/h	250	km/h
50	-	106	mph	106	-	156	mph	156	mph
43	-	92	kts	92	-	135	kts	135	kts

6.2 Placards and markings LS1-f(45)

Without Option winglets

Type: LS1-f(45)								
Serial No.:	_ Registrati	on:						
Airspeed limits:								
Winch launch and auto tow	130 km/h	81 mph	70 kts.					
Aero tow	170 km/h	106 mph	92 kts.					
Manoeuvring	170 km/h	106 mph	92 kts.					
Rough air	270 km/h	167 mph	146 kts.					
Never exceed	270 km/h	167 mph	146 kts.					
Aerobatic manoeuvres are pro	hibited							
Max. take-off mass	439 kg	968 lbs.						
Pilot weight incl. max:	110 kg	242 lbs.						
Parachute min:	60 kg	132 lbs.						
With lower pilot weight necess	ary ballast m	ust be adde	ed.					

Clearly visible at right cockpit wall

With Option Winglets

Type: LS1-f (45)								
Serial No.:	Registration:							
Airspeed limits:								
Winch launch and auto tow	130 km/h	81 mph	70 kts.					
Aero tow	170 km/h	106 mph	92 kts.					
Manoeuvring	170 km/h	106 mph	92 kts.					
Rough air without winglets	270 km/h	167 mph	146 kts.					
" with winglets	250 km/h	155 mph	135 kts.					
Never exceed without winglets	270 km/h	167 mph	146 kts.					
" with winglets	250 km/h	155 mph	135 kts.					
Aerobatic manoeuvres are proh	iibited.							
If the sailplane will be operated	with winglet	ts the use of	f water					
ballast is prohibited.								
Max. take-off mass	439 kg	968 lbs.						
Pilot weight incl. max:	110 kg	242 lbs.						
Parachute min:	60 kg	132 lbs.						
With lower pilot weight necessa	ry ballast m	ust be adde	ed.					

Clearly visible at right cockpit wall

Airspeed indicator markings without Winglets

				yellov	V	red line			
greei	n ar	c		arc					
80	-	170	km/h	170	-	270	km/h	270	km/h
50	-	106	mph	106	-	168	mph	168	mph
43	-	92	kts	92	-	146	kts	146	kts

Airspeed indicator markings with winglets

green	c		yellov	v ar	e	red line			
80	-	170	km/h	170	-	250	km/h	250	km/h
50	-	106	mph	106	-	156	mph	156	mph
43	-	92	kts	92	-	135	kts	135	kts

Issued: May 2017

LS1-f(45) continued

Without Option winglets

									
Altitude in [m]	0-2000	3000	4000	5000	6000	7000	8000	9000	10000
VNE IAS km/h	270	256	243	231	218	206	195	184	173
Altitude in [ft]	0-6560	9843	13124	16405	19685	22966	26247	29528	32809
VNE IAS kts.	146	138	131	125	118	111	105	99	93

Clearly visible at right cockpit wall

With Option Winglets

Altitude in [m]	0-2000	3000	4000	5000	6000	7000	8000	9000	10000
VNE IAS km/h	250	237	225	214	202	191	180	170	160
Altitude in [ft]	0-6560	9843	13124	16405	19685	22966	26247	29528	32809
VNE IAS kts.	135	128	122	115	109	103	97	92	86

Clearly visible at right cockpit wall

6.3 Placards and markings for all variants

Cockpit Checklist

This sailplane must be operated in compliance with operating limitations as stated in the form of markings, placards and flight manual.

- 1. Lead ballast (for underweight pilot)?
- 2. Loading plan regarded?
- 3. Parachute worn properly, static line connected?
- 4. Seat back and rudder pedals in comfortable position?
- 5. Safety harness buckled?
- 6. All controls and knobs in reach?
- 7. Dive brakes cycled and locked?8. Trim position?
- 9. Altimeter adjusted?
- 10. Positive control check? (One person at the control surfaces).
- 11. Tail dolly removed?
- 12. Tow release checked?
- 13. Canopy locked?

Clearly visible at right cockpit wall

Min. cockpit load: kg

If not 60 kg, clearly visible at instrument panel

Baggage load Max. 12 kg

At baggage compartment

Weak link max. 550 daN

On left landing gear door

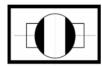
Tyre pressure 3,0 bar 43,5 psi

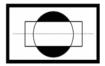
On right landing door

ON

bei elektrischer Installation am Hauptschalter

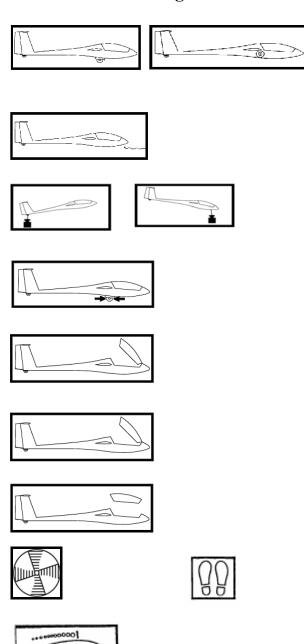
OFF





Close to ballast dump handle (if installed)

Placards and markings for all variants cont.



All placards without given position must be glued next to the respective control handle.

12 Appendix

12.1 Annual inspection checklist

Page 1 of 3

Serial No:	Reg. Signs:	Year of Manuf.:
Wings	Fuselage	Fuselage continued
Serial No.:	Serial No.:	Nose hook fitting
Spar stub	Shell and finish condition	- drive
Shell and finish condition	Cracks	function
Root ribs and pins	Drain orifices	- ground connection
Drain orifices	Rudder mounting	
Ballast bags	Stabiliser mounting	Canopy
Air brakes	Rear tangential tube	Serial No.:
Ailerons	Bushes for wing root pins	Locking mechanism
Air brakes	Cockpit	Emergency release funct.
Connecting means	Seat	Window
Aileon drives at aileron	Under seat	Ventilation system
at root ribs	Fixing of lap belt	Canopy fixing system
-fixed bearing + washer	shoulder straps	Gas strut operation
-Lateral bearing gaps	Control stick	LS latch (for emerg. relea
-Lateral gaps to wing	Elevator drive	Lift force: (8-15 kg)
-Sealing	Aileron system	(18-33 lbs)
-Stops	-L'Hotellier connectors	
-Ventilation	LS securing sleeves white	Rudder
Air brake bearings	Air brake system	Finish condition
Corrosion at levers	-L'Hotellier connectors	Shell
-Cover springing	LS securing sleeves white	Ventilation openings
-L'Hotelleir connectors	Trim system	Drive
LS securing sleeves white	Trim operation + locking	Fixed bearing + washer
Main pins	Pedals	Bearings
Wing tip skids	-Adjustment + locking	Connecting means
Option Winglets:	Rudder cables	
Tubular spars at inboard	Cable wear	Landing gear
Wings, all wingtips,	Securing of turnbuckles	Undercarriage + axle
Securing pin and catch	Earth connections	Tyre
Horizontal tail	Backrest adjustment at	Springing
Serial No.:	both ends	Bearings + joints
Finish condition	Tail skid – cable deflector	Gas strut
Sandwich shell condition	at front end	Folding strut overcenter
Stabiliser ventilation	-Skid bonding	Folding strut preset load
Elevator ventilation	Baggage comp. cover	Drive rods
Elevator drive lever	Fixed ballast front/rear	Locking in cockpit
Elevator drive bearings	Water ballast system	Wheel brake system
Bearings		Doors
Fuselage connection		C.G. hook + drive
Securing spring or ratchet		Ground conn. to control stic
Sealing		
Searing		

Place: _____ Date: _____ Stamp: _____ Signature: _____