0.1 Record of revisions continued

Rev. No.	Affected Pages/ section	Description	Issue Date	EASA Approval Date	Inserted Date Signature
8	0.5, 9.1-9.12	Electrically operated main landing gear TN1000/14	Novembe r 2008	28. January 2009	
9	0.6, 9.1, 9.2, 9.13	Special equipment for very small pilots TN1000/17	May 2010	20. July 2010	
10	0.2 – 0.5, 1.4, 1.5, 2.9, 2.10, 4.3, 4.5, 4.6, 4.8, 4.9, 4.12, 6.3 ÷ 6.6, 6.11, 7.1, 7.2, 7.8, 7.10, 7.12, 7.13, 9.7, 9.13	Manual revision TN1000/18	February 2011	13.05.11	
11	0.2, 0.5, 9.1, 9.2, 9.14, 9.15	Special equipment for aerobatics TN1000/20	March 2011	6.05.2011	
12	0.2, 0.5, 9.15	TN1000/20 Revision 1	June 2012	20.07.2012	
13	0.1 ÷ 0.5, 1.5, 2.7, 2.9, 4.6 4.8, 4.18, 5.2, 5.4, 6.4, 6.7, 7.10, 7.11, 7.13, 9.8, 9.12	Manual revision TN1000/24	October 2014	11.11.2014	
14	0.2, 0.3, 0.4, 1.4, 1.5, 1.6, 2.6, 2.8, 2.12, 4.3, 4.6, 4.13, 4.21, 5.4, 5.5	TN1000/25 18m winglets 17,2m end plates	February 2016	July 4, 2016	

0.2 List of effective pages

Section		page	issued	replaced	replaced	replaced
0		0.0	March 2002			
		0.1	see manual amendments			
		0.2	"			
		0.3	"			
		0.4	"			
		0.5	"			
		0.6	March 2002			
1		1.1	"			
		1.2	"			
		1.3	"			
		1.4	"	Febr. 2011	Febr. 2016	
		1.5	"	Febr. 2011	Oct. 2014	Febr. 2016
		1.6	"	Febr. 2016		
2	App.	2.1	March 2002	Sept. 2003		
	"	2.2	"			
	"	2.3	"			
	"	2.4	"			
	"	2.5	"	May 2008		
	"	2.6	"	Febr. 2016		
	"	2.7	"	January 2005	Oct. 2014	
	"	2.8	"	Febr. 2016		
	"	2.9	"	Sept. 2003	May 2008	Oct. 2014
			Febr. 2011			
	"	2.10	"	Febr. 2011		
	"	2.11	"	Sept. 2003		
	"	2.12	"	May 2004	May 2008	Febr. 2016
3	"	3.1	March 2002			
	"	3.2	"	May 2004	Oct. 2004	
	"	3.3	"			
	"	3.4	"			
	"	3.5	"	January 2005		
4	"	4.1	March 2002	January 2005		
	"	4.2	"			
	"	4.3	"	May 2004	Febr. 2011	Febr. 2016
	"	4.4	"			

0.2 List of effective pages (cont.)

Section		Page	issued	replaced	replaced	replaced
4	App.	4.5	March 2002	Sept. 2003	June 2004	
			Febr. 2011			
	"	4.6	"	Febr. 2011	Oct. 2014	Febr. 2016
		4.7				
	"	4.8	"	Febr. 2011	Oct. 2014	
	"	4.9	"	Febr. 2008	Febr. 2011	
	"	4.10	"			
	"	4.11	"			
	"	4.12	"	Febr. 2011		
	"	4.13	"	Febr. 2008	Febr. 2016	
	"	4.14	"			
	"	4.15	"			
	"	4.16	"			
	"	4.17	"	January 2005		
	"	4.18	"	Oct. 2014		
	"	4.19	"			
	"	4.20	"			
	"	4.21	"	Febr. 2016		
	"	4.22	"			
	"	4.23	"			
	"	4.24	"			
5	"	5.1	March 2002			
	"	5.2	"	Oct. 2014		
	"	5.3	"			
	"	5.4	"	Sept. 2003	Oct. 2014	Febr. 2016
	App.	5.5	"	Febr. 2016		
		5.6	"			
		5.7	"			
6		6.1	March 2002			
		6.2	"			
		6.3	"	Sept. 2003	Febr. 2011	
		6.4	"	Febr. 2011	Oct. 2014	
		6.5	"	Sept. 2003	Febr. 2011	
		6.6	"	Febr. 2011		
		6.7	"	Oct. 2014		
		6.8	"			
		6.9	"			
		6.10	"	Sept. 2003		
		6.11	"	Febr. 2011		

1.4 Descriptive data

The DG-1000S is a two-place high performance sailplane for training and cross country flying and in addition for aerobatic training.

The wings of the DG-1000S are made of carbon fibre reinforced plastics with a parting at y= 8,6m, there are four types of wing tips available with different spans:
A) Wing elongations with 20 m span with winglets
B) Wing tips with 18 m span without winglets
C) Wing tips with 18 m span with winglets
D) End plates for 17,2 m span

- Automatic hook ups for all controls.
- Comfortable seating and modern cockpit design similar to the DG-single-seaters - safety cockpit.
- Large 2 piece canopy for very good in-flight vision.
- Draught free canopy demist and 1 adjustable swivel air vent for each pilot.
- Sealed airbrake and landing gear boxes.
- Controls in each cockpit.
- All controls are operated with the left hand, which enables the right hand to remain on the control stick.

The DG-1000S is available with 3 different versions of the undercarriage:
A) Very high spring mounted retractable main wheel with disc-brake, tail wheel.
B) High spring mounted retractable main wheel with disc-brake, tail wheel and nose wheel
C) Fixed spring mounted main wheel with disc-brake, tail wheel and nose wheel.
The main undercarriages versions B and C are interchangeable.

Other characteristics:
Waterballast in the wings and in the fin are optional with 18m span and standard with 20m span.

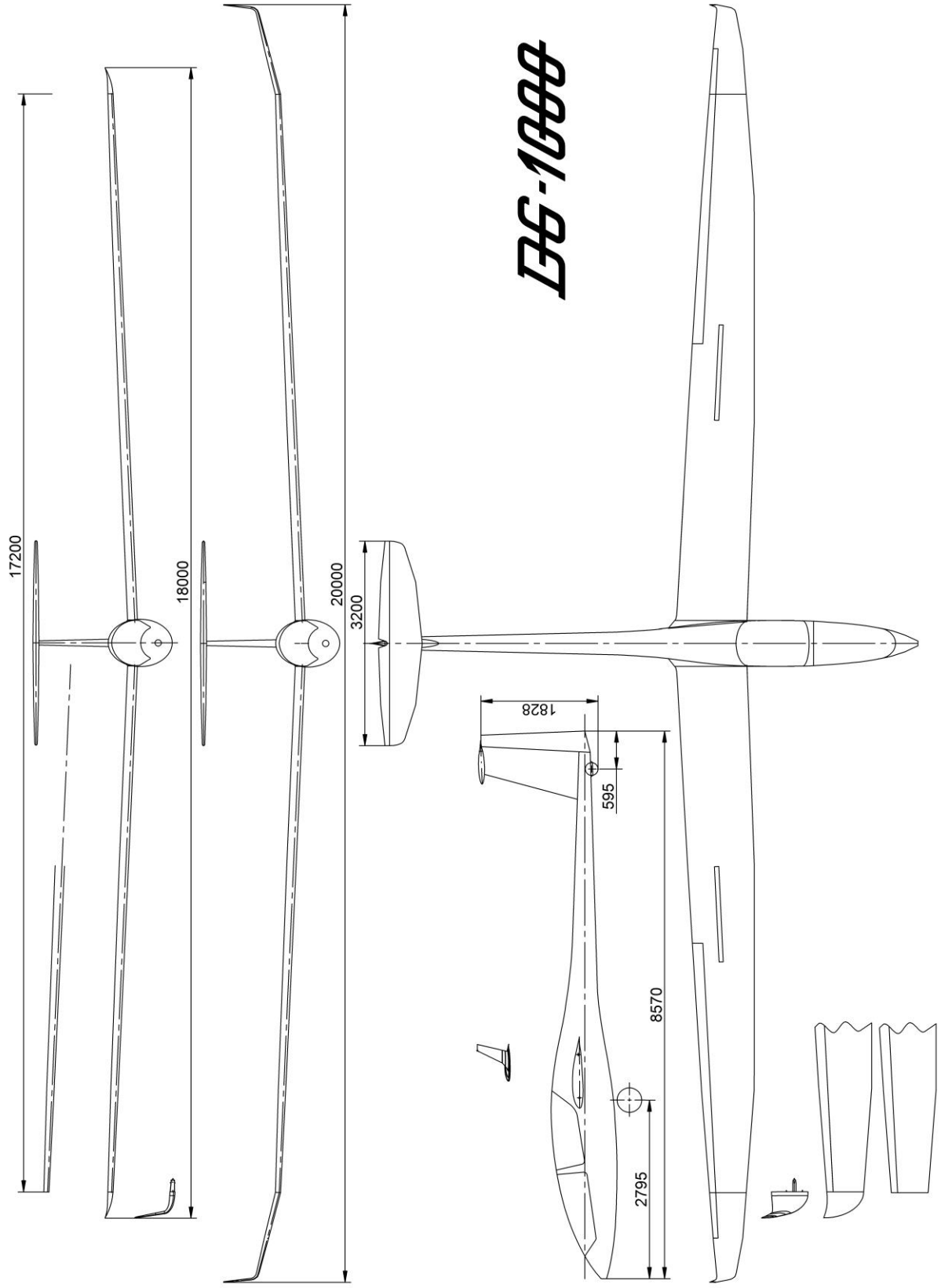
Standard: A ballast-box is installed in the fin. It can be used to compensate the mass of the rear pilot and as a trim-possibility for heavy pilots.
Max. ballast capacity: 12 kg.

Option: 2 ballast boxes in the front cockpit. The trim-weights used for the trim-ballast box in the fin also fit into these ballast boxes.

Technical data				
Span	m	17,2	18	20
Wing area	m^2	16,3	16,72	17,53
Aspect ratio	/	18,15	19,38	22,82
Length	m		8,57	
Fuselage height	m		1,0	
Fuselage width	m		0,73	
Span of the horizontal tailplane	m		3,2	
Waterballast Wings	max. kg (l)		160	
Waterballast fin	max. kg		6,2	
Trim ballast fin	max. kg		12	
Empty mass with basic instruments*	approx. kg	407	411	415
Wing loading (with one Pilot 80kg)	approx. kg/m²	29,9	29,4	28,2
max. take off mass (max. TOW)	kg	750	750	750
max. wing loading	kg/m²	46,0	44,9	42,8
Aerobatics		unlimited Category „A“	unlimited Category „A“ (without winglets)	simple
max. TOW for aerobatics (cat. A)	kg	630	630	
max. speed	km/h	270	270	270

*Options will increase the empty mass accordingly!

1.5 three view drawing



2.5 Centre of gravity

Centre of gravity range in flight is
190mm (7.48 inch) up to 440mm (17.32 inch) behind datum.

Datum = wing leading edge at the rootrib.
reference line = aft fuselage centre line horizontal.

C.G. diagrams and loading chart see sect. 6.

2.6 Approved manoeuvres

Category „Utility“:

The glider is certified for normal gliding in the "Utility" category.
Simple aerobatics are approved but only without waterballast and with the weight of the rear pilot compensated by ballast in the ballast box in the fin see section 6.8.7.

The following aerobatic manoeuvres are approved with all spans:

Spins	Chandelle
Inside loop	Turn
Lazy Eight	

Recommended entry speeds see section 4.5.8.1.

Category „Aerobatic“

Span 17,2 m or 18 m without winglets and without water ballast, max. mass 630 kg (1389 lbs.) and with the required equipment see section 2.10 installed and with the weight of the rear pilot compensated by ballast in the ballast box in the fin see section 6.8.7.

In addition to the manoeuvres in category „Utility“ the following manoeuvres are approved:

Inverted flight	half flick roll from normal to inverted flight with half loop
half loop and half roll	half flick roll from inverted to normal flight
half roll and half loop	
slow roll	

Recommended entry speeds see section 4.5.8.2.

2.9 Kinds of operation

A) **All configurations**

Flights according to VFR (daylight)
Aerotow
Winch- and auto-launching

B) **In addition when flying without waterballast**

1. Cloud flying (daylight): permitted when properly instrumented (see section 2.10).
2. Simple aerobatics see sect. 4.5.8.1. Category „Utility“
3. Aerobatics see section 4.5.8.2. Category „Aerobatic“ if the required equipment (see section 2.10 c)) is installed, only with 17,2 m span or 18 m span without winglets, max. mass 630 kg (1389 lbs.).

Note: Cloud flying is not permitted in the USA, Canada and Australia.

2.17 Limitations placards

DG Flugzeugbau GmbH
Type: DG – 1000S Serial No.: 10- S
Year of construction:

Maximum airspeeds	km/h	kts.
Winch launching	150	81
Aero-tow	185	100
Manoeuvring V_A	185	100
Rough air	185	100
Maximum speed V_{NE}	270	146

Approved aerobatic manoeuvres, only without waterballast:
Pos. Loop, Chandelle, Spin, Stall turn
In addition Category A:
Only with 17,2m or 18 m span without winglets, without water ballast:
Half loop and half roll, half roll and half loop, slow roll, inverted flight, half positive flick roll from normal flight with half loop, half negative flick roll from inverted flight
Maximum mass:

Category A	630 kg	1389 lbs.
Category U	750 kg	1653 lbs.

Loading chart

Cockpit load	front seat		rear seat		(Parachute
maximum	110 kg	242 lbs.	90 kg	198 lbs.	included)
or maximum	105 kg	231 lbs.	105 kg	231 lbs.	
minimum	kg	lbs.	/	/	

With lower pilot weight necessary ballast must be added.

Cockpit Check
1. Lead ballast (for under weight pilot)?
2. Parachute worn properly?
3. Safety harness buckled?
4. Front seat: pedals adjusted?
   Rear seat: seating height adjusted?
5. All controls and knobs in reach?
6. Altimeter?
7. Dive brakes cycled and locked?
8. Positive control check ? (One person at the control surfaces).
9. Fin ballast tank emptied or correct amount filled in?
10. Trim ballast box in the fin, correct amount filled in? Locking device completely engaged?
11. Trim?
12. Both canopies locked?
13. Runway free?

limits for use of the waterballast tank

minimum ground temperature	°C	13.5	17	24	31	38
	°F	56	63	75	88	100
maximum flight altitude above GND	m	1500	2000	3000	4000	5000
	ft.	5000	6500	10000	13000	16500

Altitude in [m]	0-3000	4000	5000	6000	7000	8000
V_{NE} IAS km/h	270	256	243	230	217	205
Altitude in [ft]	0-10000	13000	16000	20000	23000	26000
V_{NE} IAS kts.	146	138	131	124	117	111

at the upper left hand side of the fin

Other cockpit placards see section 7

Gepäck max. 15 kg
baggage max. 33 lbs.

Sollbruchstelle 10000 N
rated load 2200 lbs.

Reifendruck 4 bar
Tyre pressure 58 psi
Tail wheel

Reifendruck 2,5 bar
Tyre pressure 36 psi
Main wheel

Reifendruck 2,5 bar
Tyre pressure 36 psi
Nose wheel (if installed)

Ballast box in the fin
Min. load in the front seat
kg **box empty** **box filled** kg

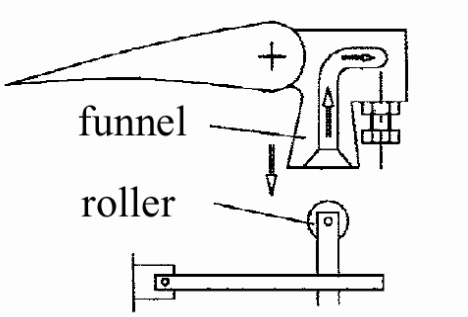
At the control-light in the front instrument panel

Warning:
Rigging of the horizontal tailplane is only permitted with nose down trim-setting!

4. Rigging of the stabilizer
   Install the battery Z110 or a ballast weight of 5.5kg (12.1 lbs.) in the battery box in the fin, connect the battery. Exemption for extremely light pilots, see section 6.8.4.
   Caution: Rigging of the horizontal tailplane is only permitted with **nose down** trim-setting. Therefore operate the trim release lever and push the control stick forward, then release the lever to engage the trim (don't operate the trim control knob, the trim should not be pushed to the most nose down position).

   Screw the tool W 38/2 into the securing plate (near the top of the left surface of the fin). Pull out the securing plate with the tool, move it downwards to engage in the rigging position. Set the stabilizer on, so that the roller at the fuselage side push rod is inserted into the funnel at the elevator.

   Watch carefully the procedure!

   When the stabilizer is set down and laying on the fin, push it aft. The roller will engage and slide forward in the funnel if you hold the elevator in the pertinent position.

   Release the securing device by pulling out with the tool and engage the securing device by lifting the tool. The securing plate must be flush with the surface of the fin. Screw out the tool.

   Check for correct elevator connection by looking from the rear into the gap at the right hand side of the rudder.

5. Rigging of the outboard wing panels (20m wing extensions or 18m or 17,2m wing tips): Insert the wing tip extensions into the wing. Press in the locking pin with your finger.
   Insert the wing tip as far as the aileron connector starts to slide onto the aileron.
   Strike firmly with the palm of your hand on to the wing tip to lock in the wing tip extension.

6. Tape the gaps of the wing-fuselage junction and at the wing joint.

7. Execute a positive control check, one helper to hold firmly the control surfaces is needed.

Ballast box in the fin cont.

In addition with TN413/4 executed, standard from ser. no. 10-49 on:
A switch will be operated by the locking pin of the ballast box cover. As long as the switch is not closed, the control light for the ballast box will blink with doubled speed without interruption. The blinking can't be switched off by pressing on the control light contrary to the blinking which indicates the amount of ballast.

4.2.5 Derigging

Derigging follows the reverse of rigging.
Waterballast must be dumped first.
Lock the airbrakes.
For disassembling the securing pins of the wings the tool W 38/2 must be screwed into the thread completely.
The brass part of the tool will then disengage the securing of this bolt.
It is recommended to leave the securing pin in the right wing while you derig the left wing.

Derigging of the outboard wing panels (20m wing extensions or 18 m or 17,2 m wing tips):
Use a 6 mm diameter pin (e.g. tool W36) for pressing in the locking pin on the wings upper side. Pull out the wing tip or the wing extension.

4.5.3 Approach and landing

4.5.3.1 Normal landing

It is recommended to dump the waterballast before landing even on airfields. Dump the ballast before an outlanding in any case.

Abeam the landing point extend the landing gear. In calm weather approach with approx. 100 km/h (54 kts.) (ballast dumped!). With strong wind and / or waterballast fly faster! The very effective Schempp-Hirth dive brakes make a short landing possible. So a slip is not necessary as a landing technique.

Caution: While slipping the rudder is sucked in its displaced position. So it is recommended to practise slipping at a higher altitude.
The slip can be introduced at the recommended approach speed see above.
To recover from the slip neutralize the aileron control first, this will reduce the force which sucks the rudder in its displaced position.
During the slip the airspeed indicator shows airspeed values which are too low, so the slip must be executed with regard to the position of the horizon.
No influence on the slipping characteristics when slipping with partially filled waterballast is noticeable.
If flown in 18m span with winglets, the glider tends to turn, even with full opposite rudder. Therefor sideslip is not a suitable way to make a steeper approach on final.

Strong crosswind offers no problem.

Do not approach too slowly with fully extended airbrakes otherwise the aircraft may drop during flare out. When flaring out keep the airbrake setting you were using, opening them further may drop the sailplane!

You can land the DG-1000S on soft fields with the landing gear extended, as there is no tendency of nosing over. During touch down pull the stick completely to avoid the fuselage nose touching the ground.

After landing in a muddy field clean the landing gear and tow releases.
Dirt in the front strut can keep the landing gear from locking over centre next time.
With TN1000/13 executed, standard from ser. no. 10-133 on:
Dirt in the landing gear positive locking device (notch and latch at the landing gear struts).may keep the latch from engaging in the notch next time.
Simply hosing with water is the best cleaning method (don’t use a high pressure cleaner).

4.5.8.2 Category A, Aerobatic

Only approved with 17,2m span or 18m span without winglets, without water ballast, max. mass 630 kg (1389 lbs.) and with the weight of the rear pilot compensated by ballast in the ballast box in the fin see section 6.8.7 and with the required equipment installed see section 2.10.
Execute only the approved manoeuvres.
Don't execute aerobatics below the safety altitude required by national law.

Approved manoeuvres (Category A, Aerobatic):
All manoeuvres approved for category U, Utility and additionally:

Approved manoeuvres	**recommended airspeed**	**g-load**
Inverted flight	120 - 200 km/h (65-108 kts.)	-1
Approved manoeuvres	**entry speeds**	**g-loads**
half loop and half roll	220 km/h (119 kts.)	+5.0
half roll and half loop	180 – 200 km/h (97-108 kts.)	+4.5
slow roll	180 - 200 km/h (97-108 kts.)	+/-1.5
half positive flick roll from normal to inverted flight with half pos. loop	120 - 140 km/h (65 - 76 kts.)	+4.0
half negative flick roll from inverted to normal flight	130 – 150 km/h (70 - 81 kts.)	-3.5

Caution: the DG-1000S is equipped with a powerful longitudinal trimming device. In addition the mass balance weight of the elevator is incorporated in the elevator control system. Due to these facts the elevator control forces during inverted flight change considerably with trim position.
It is strongly recommended to trim the glider to approx. 140 km/h (76 kts.) in horizontal flight prior to executing aerobatics, especially prior to inverted flight.

5.2.2 Stall speeds

The given speeds are the minimum achievable speeds during level flight in km/h and (kts.).

Airbrakes retracted 20m span							
mass kg	470	500	550	600	650	700	750
mass lbs.	1036	1102	1213	1323	1433	1543	1653
W/S kg/m²	26,8	28,5	31,4	34,2	37,1	39,9	42,8
W/S lbs./ft.²	5.5	5.84	6.43	7.01	7.59	8.18	8.76
V km/h	62,9	64,9	68,0	71,1	74,0	76,8	79,5
V kts.	34	35	36.7	38.4	40	41.5	42.9
Airbrakes retracted 18m span							
W/S kg/m²	28,1	29,9	32,9	35,9	38,9	41,9	44,9
W/S lbs./ft.²	5.76	6.12	6.43	7.35	7.96	8.57	9.18
V km/h	64,4	66,4	69,7	72,8	75,8	78,6	81,4
V kts.	34.8	35.9	37.6	39.3	40.9	42.4	44
Airbrakes retracted 18m span with winglets							
V km/h	62.2	64.1	67.3	70.2	73.1	75.9	78.5
V kts.	33.6	34.6	36.3	37.9	39.5	41.0	42.4
Airbrakes retracted 17,2m span							
W/S kg/m²	28.8	30.7	33.7	36.8	39.9	42.9	46.0
W/S lbs./ft.²	5.91	6.28	6.91	7.54	8.17	8.80	9.42
V km/h	65.2	67.2	70.5	73.6	76.6	79.5	82.3
V kts.	35.2	36.3	38.1	39.7	41.4	42.9	44.4
Airbrakes extended 20m span							
mass kg	470	500	550	600	650	700	750
V km/h	67,4	69,5	72,9	76,2	79,3	82,3	85,1
V kts.	36,4	37,5	39,4	41,1	42,8	44,4	46,0
Airbrakes extended 18m span							
V km/h	69,0	71,2	74,7	78,0	81,2	84,2	87,2
V kts.	37,3	38,4	40,3	42,1	43,8	45,5	47,1
Airbrakes extended 18m span with winglets							
V km/h	67.5	69.6	73.0	76.3	79.4	82.4	85.3
V kts.	36.5	37.6	39.4	41.2	42.9	44.5	46.1
Airbrakes extended 17,2m span							
V km/h	69.8	71.9	75.5	78.8	82.0	85.1	88.1
V kts.	37.7	38.8	40.7	42.6	44.3	46.0	47.6

The loss of height for stall recovery is approximately 50 m (160 ft) if recovered immediately.

5.3 Additional Information

5.3.1 Demonstrated crosswind performance

The demonstrated crosswind velocity is 15 km/h (8 kts) according to the airworthiness requirements.

5.3.2 Gliding performance

Performance data with **20 m** span (S = 17,53 m²)

wing loading	kg/m²	28	35	42
minimum sink	m/s	0,51	0,56	0,62
at	V [km/h]	79	88	98
best glide ratio	/	45,9	46,3	46,6
at	V [km/h]	93	104	120

Performance data with **18 m** span (S = 16,72 m²)

wing loading	kg/m²	30	36	45
minimum sink	m/s	0,60	0,65	0,72
at	V [km/h]	84	90	100
best glide ratio	/	41,5	41,7	42
at	V [km/h]	100	110	123

With winglets on the 18 m wing tips (optional) the best glide ratio is increased by 0,5 points.

With **17,2 m** span (S = 16,30 m²) the best glide ratio decreases by 1,5 glide points, compared to 18 m span without winglets.

A variation in speed by ± 10 km/h (5 kts.) from the above will decrease the best glide angle by 0.5 glide points and increase the min. sink rate by 1 cm/sec. (2 ft/min).
The polar curves can be seen on the next page.

For optimum performance, the aircraft should be flown with a C.G. towards the rear of the allowable range. This especially improves thermalling performance. However the aircraft will be more pitch sensitive.

The wing fuselage joint, wing parting and the tail plane fin joint should be taped up and the aircraft thoroughly cleaned to obtain maximum performance.

The polars apply to a "clean" aircraft.
With dirty wings or flight in rain, the performance drops accordingly.